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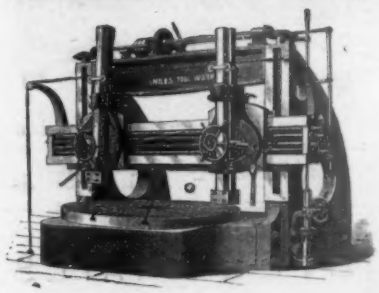

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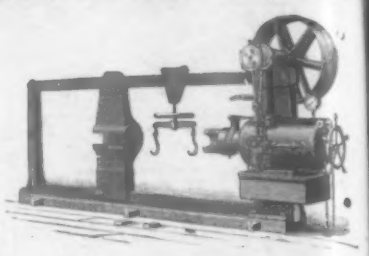

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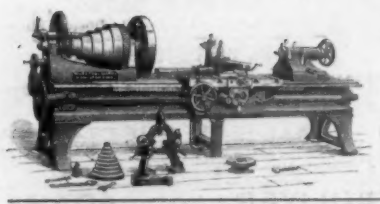

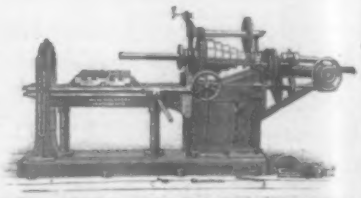

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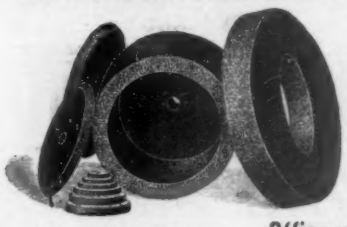

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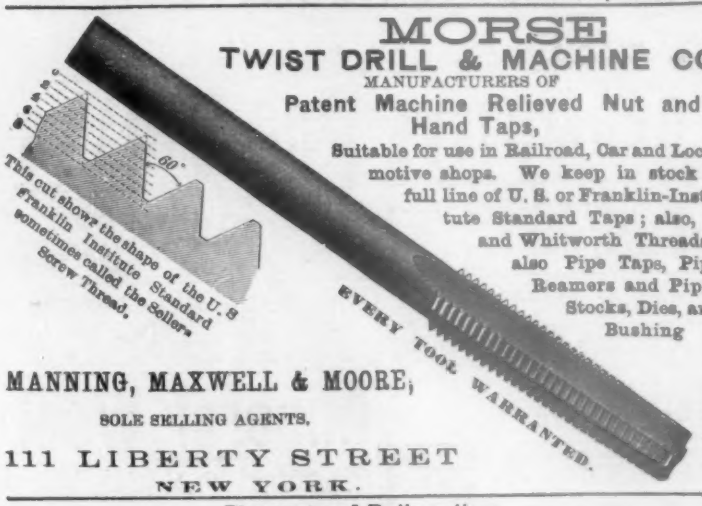
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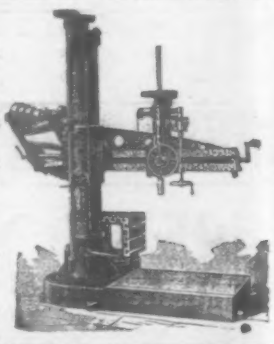

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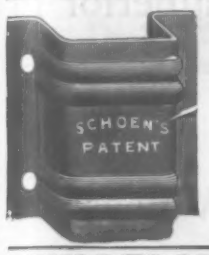

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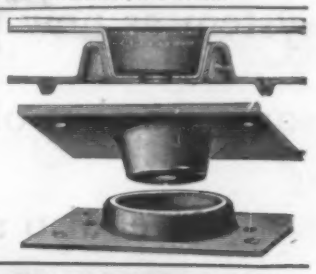

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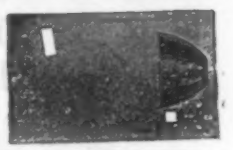

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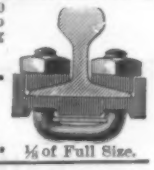

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ALPHABETICAL INDEX TO ADVERTISEMENTS.

Classified Index on the next page.

Abendroth & Root Mfg. Co. 9
Acme Machy. Co. 1
Adams, Oliver 1
Adams & Westlake Co. 2
Aetna Iron & Steel Co. 16
Aitchison, R., Perf. Metal Co. 12
Ajax Metal Co. 34
Akron Tool Co 34
Allen Paper Car Wheel Co. 1
Allentown Rolling Mills 1
Allison Mfg. Co 36
American Car Door Co. 32
American Fluoride Co. 6
American Steel Scraper Co. 16
American Steel Wheel Co. 31
American Washer & Mfg. Co. 34
Anderson & Barr 37
Appleton, Thomas 13
Ashcroft Mfg. Co. 1
Ashton Valve Co. 1
Austin, F. C., Mfg. Co. 15
Auto-Interch. Car Coup. Co. 27
Baker, Wm. C. 15
Baldwin Loco. Wks. 30
Baltimore Car Wheel Co. 15
B. & O. R. R. 15
Barkly & House 11
Barnes, D. L. 12
Barnum & Richardson Mfg. Co. 32
Bement, Mills & Co. 8
Berlin Iron Bridge Co. 35
Berry & Orton Co. 8
Bethlehem Iron Co. 1
Billings & Spencer Co. 7
Blackmer & Post Pipe Co. 1
Bliss, E. W., Co. 8
Bloomsburg Car Co. 36
Bogue & Mills Mfg. Co. 8
Boies Steel Wheel Co. 31
Boston Bridge Works 36
Boston & Albany R. R. 33
Bowler & Co. 1
Boyden Brake Co. 14
Boyer Ry. Speed Recorder 16
Boyer Ry. Speed Recorder 16
Bradley, Osgood & Son 1
Bridgeport Mach. Tool Works 40
Brightly, C. H. 13
Brill, J. G. & Co. 36
Brooks Loco. Wks 35
Brown Bros. & Co. 1
Brown Hoist. & Conv. Machine Co 16
Brown & Sharpe Mfg. Co. 32
Buckeye Auto. Car Coup. Co. 39
Bucyrus Steam Shovel & Dredge Co. 17
Buda Foundry & Mfg. Co. 1
Buffalo Seal & Press Co. 16
Burkhardt's, Geo. J. Sons 1
Bunowes Car Shade Co. 34
Bush Cattle Guard Co 11
Butler Drawbar Attach. Co. 1
Cabell, L. Breckinridge 13
Cambria Iron Co. 18
Canda Mfg. Co. 36
Canning, R. & Co. 1
Canton Steel Roofing Co. 38
Car Ventilator Co. 38
Carlin's Sons, Thos 13
Cayuta Wheel & F'dry Co. 29
Central Oil & Supply Co. 3
Chester Steel Castings Co. 40
Chicago Bridge & Iron Co. 37
C., B. & Q. R. R. 33
C. C. C. & St. L. Ry. 15
C., H. & D. Ry. 33
C., M. & St. P. Ry. 33
C. R. I. & P. Ry. 15
Chicago & Alton R. R. 30
Chicago & N. W. Ry. 33
Church Co., John 12
Cleveland City Forge & Iron Co. 1
Cleveland Frog & Cross. Co. 1
Connelly, J. T. 36
Consolidated Car Heating Co. 25
Cont. Rail Joint Co. of Amer. 25
Cooke Loco. & Mach. Co. 35
Copeland & Bacon 1
Creosote Lum. & Const. Co. 36
Croes, J. J. R. 13
Curtis Regulator Co. 30
Cushion Car Wheel Co. 30
Damascus Bronze Co. 34
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Egan Co., The 9
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Engin. Employm. Bureau 28
Engineering Magazine 1, 12
Eno Rail Joint Co 35
Ensign Mfg. Co. 36
Erie Car Works 36
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Evans, Geo. A. 1, 13
Excelsior M. & B. Co. 13
Fairbanks, Morse & Co. 10
Falls Hollow Stay Bolt Co. 34
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Gould & Eberhardt 1
Gould Mfg. Co 31
Greenlee Bros. & Co. 6
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Hall Signal Co. 19, 20
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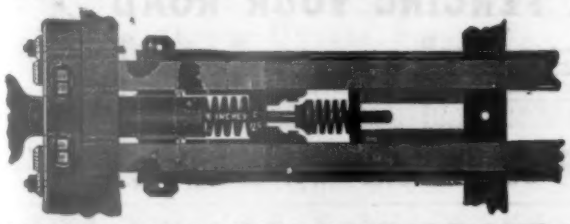

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Abendroth & Root M.Co., 28 Cliff St., N.Y.

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Cleveland (O.) Frog & Crossing Co.
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Pennsylvania Steel Co., Steelton, Pa.

Gauges (Pressure)
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F. C. Austin Mfg. Co., Chicago, Ill

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Sheffield Velocipede Car Co., Three Rivers, Mich.

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Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.

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Lidgerwood Mfg. Co., 96 Liberty St., N.Y.
J. S. Mundy, Newark, N. J.
Vulcan Iron Works, Chicago.

Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.

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Joseph F. McCoy Co., 26 Warren St., N.Y.
Watson & Stillman, 210 E. 43d St., N. Y.

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Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
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Phosphor-Bronze Smelting Co., Philada.
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Vulcan Iron Works, Chicago.

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Tinius Olsen & Co., Philadelphia, Pa.
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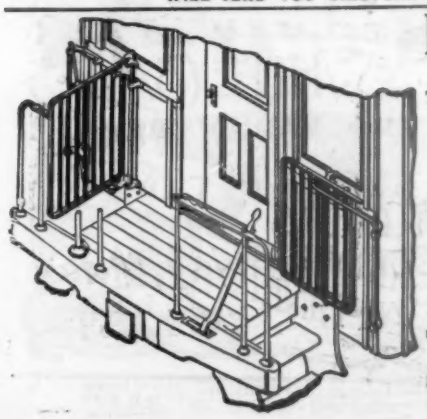

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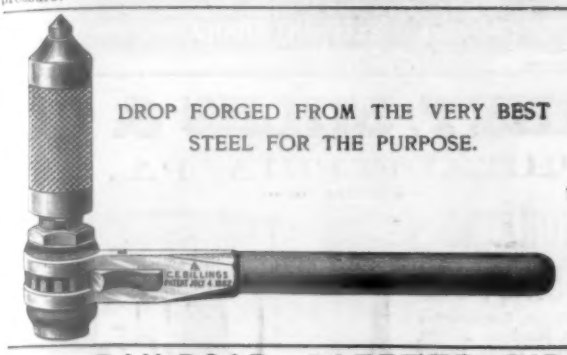

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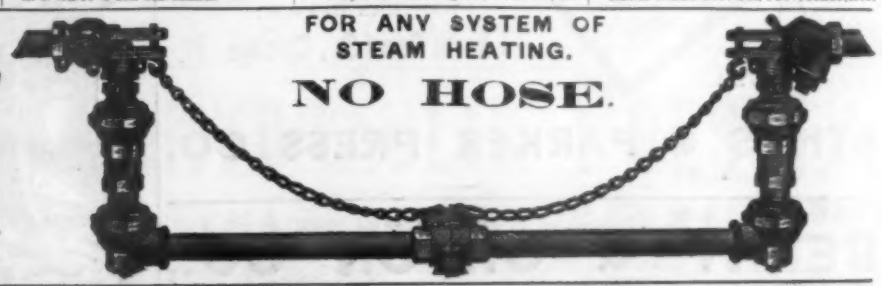

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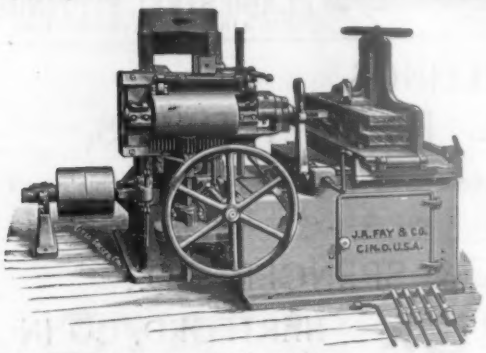

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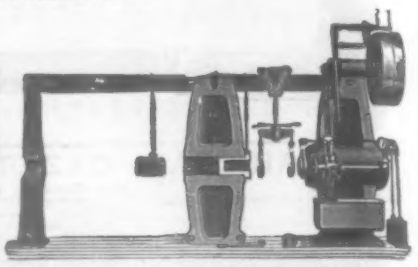

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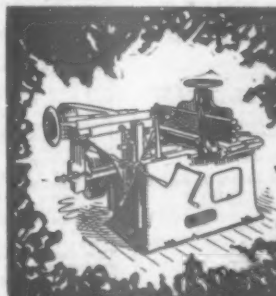

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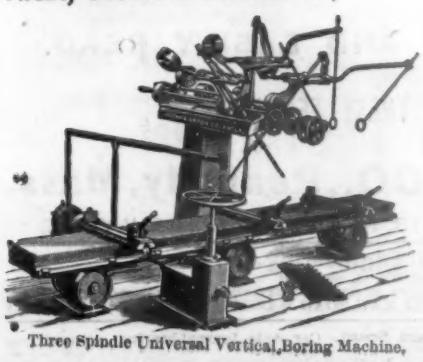

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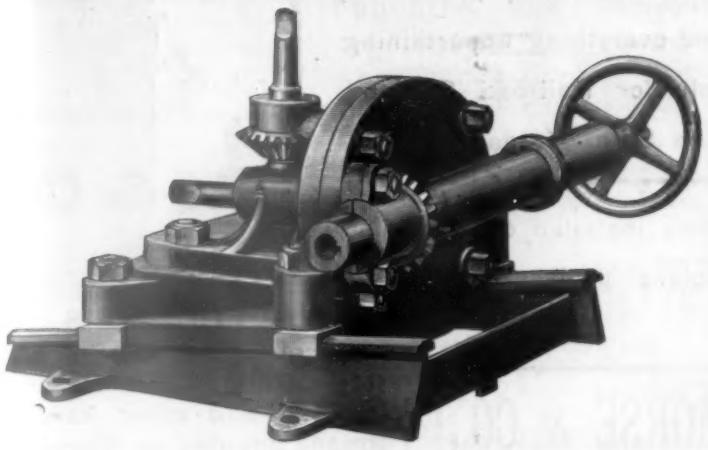

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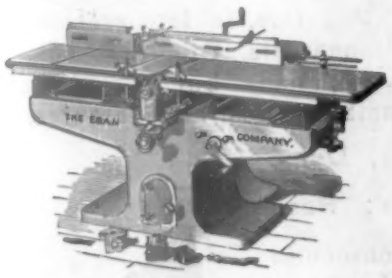

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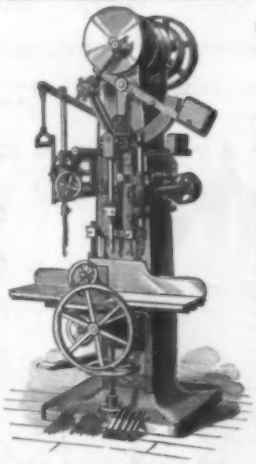

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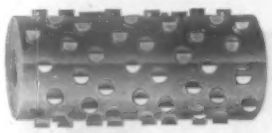

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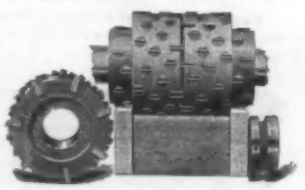

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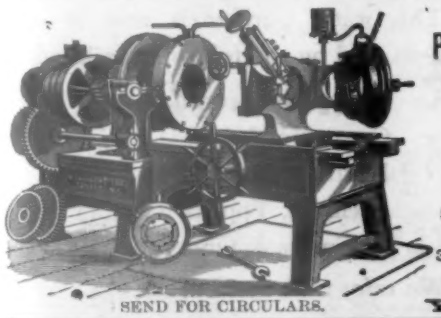

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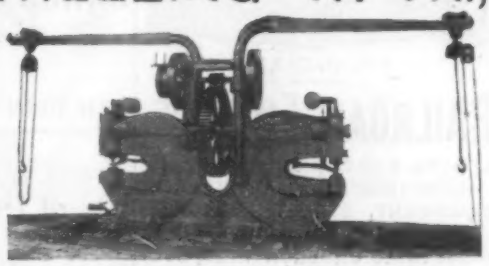

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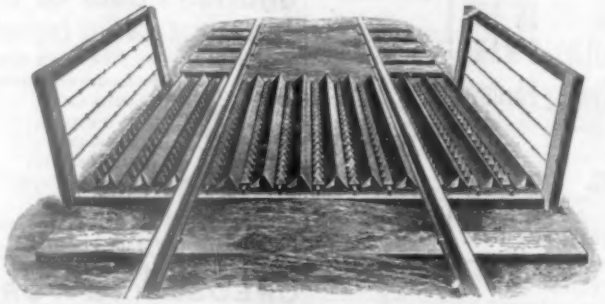

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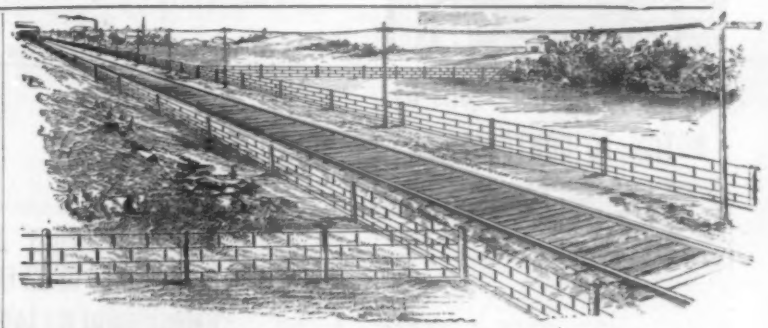

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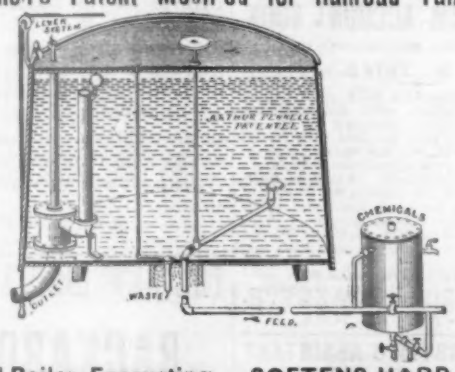

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THE RAILROAD ISSUE

—OF—

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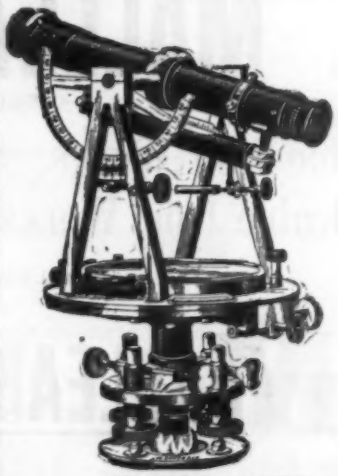

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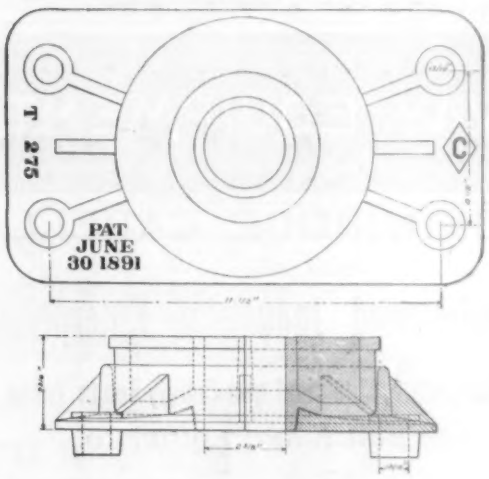

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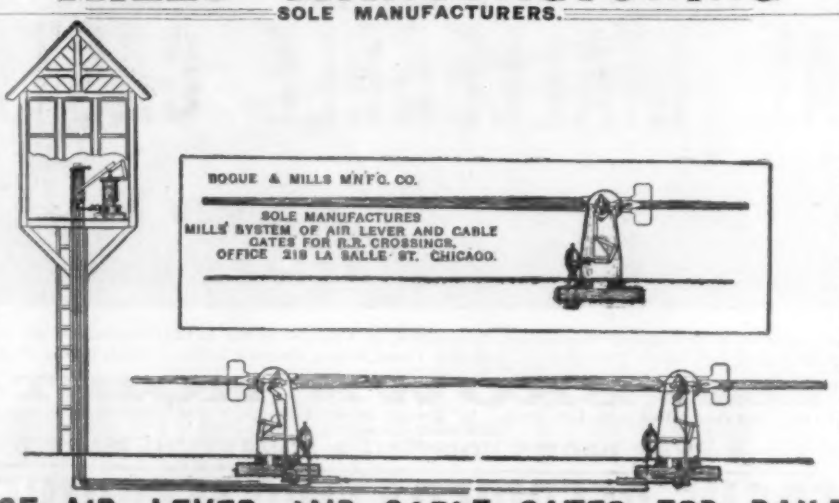
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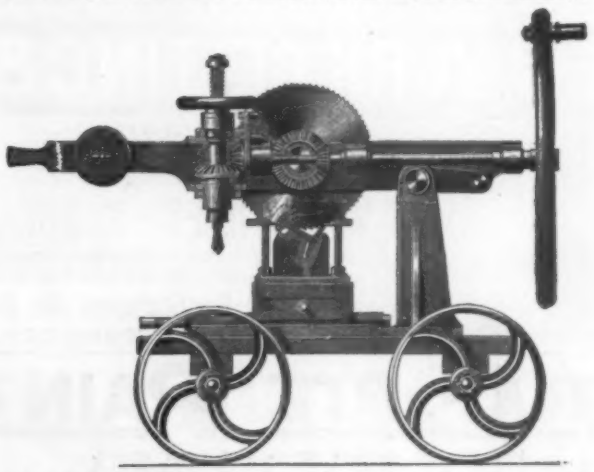

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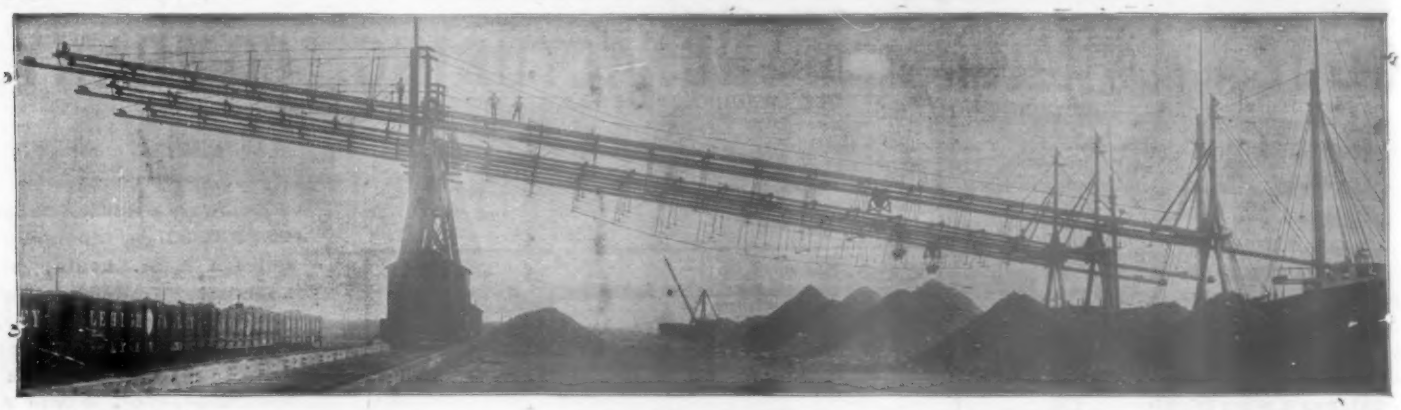

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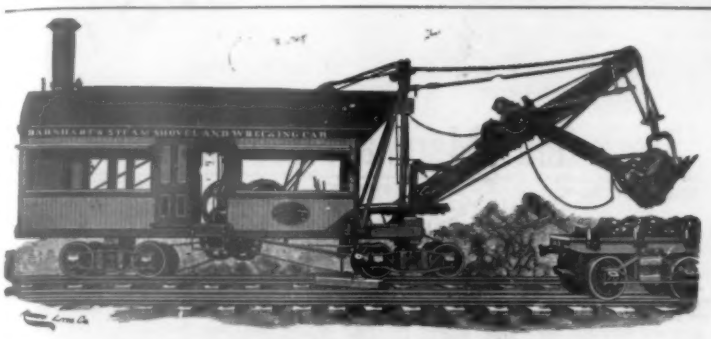

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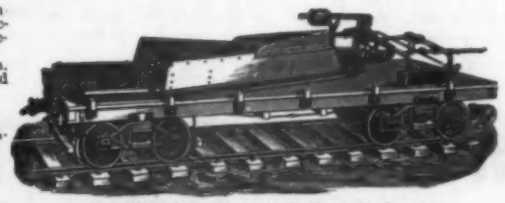

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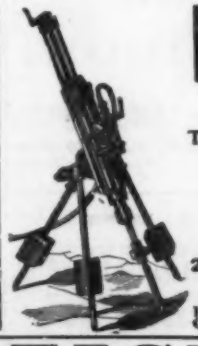

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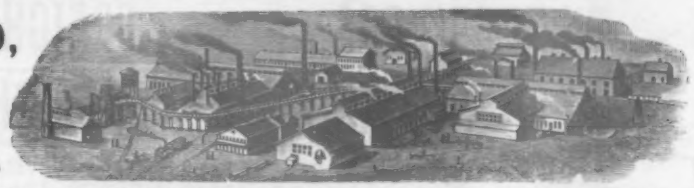

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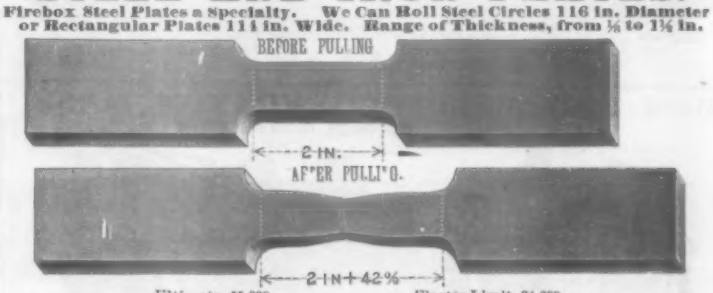

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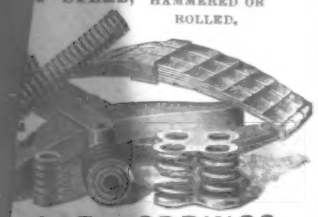

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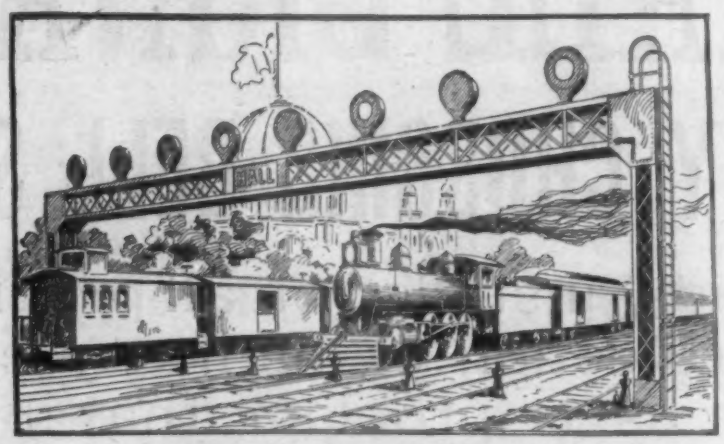

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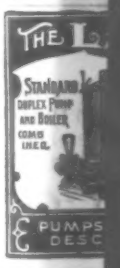

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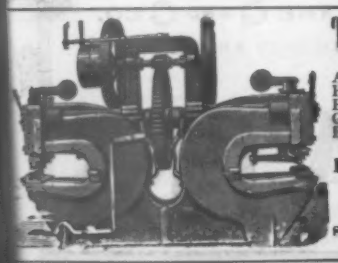

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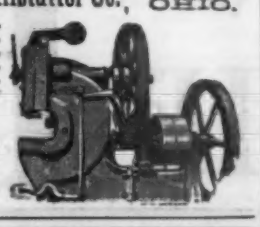

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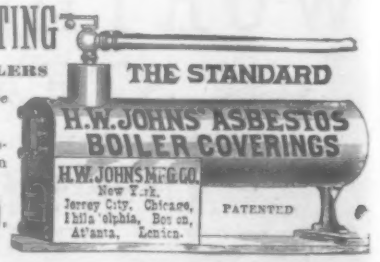

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RAILROAD GAZETTE

FRIDAY, OCT. 7.

CONTENTS.

ILLUSTRATIONS: PAGE.

Brick Arches, Illinois Central Railroad..... 741
The Angle of Countersunk Heads for Machine Screws..... 741
The Vaughan Spring Rail Frog..... 742
The Eberhardt Portable Rail Saw and Drill.... 743
Tramway at Rumsey, Mont..... 745
The Lidgerwood "Rapid Unloader"..... 746
A Screw Ferry-Boat..... 747

CONTRIBUTIONS:

Track and High Speed.. 749
The Position of Buildings at Small Stations 750
The Troubles of a Grammarian..... 750
"One Cent Per Diem"—A Letter from the Author of the Plan.... 739

EDITORIALS:

The Six Old Chicago Railroads..... 748
Uniformity in Block and Interlocking Signal Systems..... 748
Transportation to the World's Fair..... 749
Freight Trains Partially Air Braked..... 749

EDITORIAL NOTES..... 748, 750

PAGE.

New Publications..... 750
Trade Catalogues 750

GENERAL NEWS:

Locomotive Building.... 752
Bridge Building..... 752
Railroad Law..... 753
Meetings and Announcements..... 753
Personal..... 754
Elections and Appointments..... 754
Railroad Construction.. 755
General Railroad News. 756
Traffic 756

MISCELLANEOUS:

Technical..... 751
The Scrap Heap..... 752
Honoring an American Engineer..... 739
Preliminary Tests of the Purdue University Locomotive "Schenectady"..... 742
The Liverpool Overhead Railroad..... 747
Curve Resistance..... 743
A Launch at Sparrow's Point..... 744
Wire Rope Transportation and Transmission. 745
Abolition of Grade Crossings..... 750
Railroad Legislation During the Past Year. 747
La Guaira and Caracas Railroad..... 751

Contributions.

Track and High Speed.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Statements appeared in your paper a month ago claiming that the principal objection to running trains 100 miles an hour was that the track was not ready for it—that the motive power people could easily get their engines ready if the track was fit.

From the figures in your report of August accidents where 5 per cent. of the accidents are chargeable to track, 15 per cent. to equipment, and 31 per cent. to negligence of operating, it does not look as if the track was very much behind. The motive power department will have to get some other excuse. CHIEF ENGINEER.

The Position of Buildings at Small Stations.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I would like to have your opinion and the opinion of your readers as to the relative advantages and disadvantages of sidings in front and back of combined passenger and freight stations as shown by the sketches below.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4

I have often thought a scheme like that shown in Fig. 3, that is, to have the freight track between two narrow buildings, would have some advantages. A cross-section of this building would be like the sketch shown in Fig. 4. W. O. LELIME.

The Troubles of a Grammarian.

ROANOKE, Va., Sept. 20, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Upon the sign boards erected at public crossings and other places along the line of very many railroads throughout the country we frequently observe the inscription, "Do not walk nor trespass on the railroad." To any one acquainted with the syntax of the English language this notice is an eyesore, and although very generally used it is grammatically incorrect and can be neither analyzed nor parsed. Occasionally we see this sign properly written, as, for example, at some points on the Pittsburgh division of the Pennsylvania Railroad, while at very many points on the same division and at nearly every point on the other divisions of the same line it is written as above. The notice should properly be written, "Do not walk or trespass on the railroad." In fact it is the only way it can be written in accordance with the rules of English construction. This is, of course, a simple matter, but to the mind of a thoughtful or intelligent child or youth who rarely allows an object of this sort to go unobserved, it is very seriously misleading and leaves a wrong impression. It seems there is no reason why the warning could not with just as much facility be written properly as erroneously.

B. A. BROPHY, *Norfolk & Western Railroad.*

[We often blush for the railroad sign painter and sometimes take a shy at him; but he replies that the business of the English language is "to git there," and goes on unabashed.—EDITOR RAILROAD GAZETTE.]

"One Cent Per Diem."—A Letter from the Author of the Plan.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In this year's convention of the International Association of Car Accountants a resolution was offered providing for the adoption of a per diem system of one cent a car in addition to the existing charge of three-quarters of a cent a mile. The purpose in making the per diem one cent was avowed to be that "the per diem system may be approached gradually and with due caution as to its financial results." All railroad companies' cars and all line cars owned by railroads were to receive the per diem, plus the mileage; all other cars were to receive straight mileage only. The one cent plan makes no distinction between line cars owned by railroads and other railroad cars, because there is no substantial difference between them. The discussion on this measure lasted through two sessions of the convention, and the deliberation with which it was considered will be indicated by saying that it was rejected once by a large majority, and was twice laid on the table, and was then finally adopted, on a call of the roads, by a vote of 31 to 19. Among the roads [car accountants] who voted for its adoption were those [of the] New York Central, the Erie, the Pennsylvania, the West Shore, the Philadelphia & Reading, the Southern Pacific, the Canadian Pacific, the Great Northern and the Atlantic Coast Line. The Baltimore & Ohio was not represented; neither were the Burlington, the Milwaukee or the Rock Island, and the Northwestern seems to have been absent when the final vote was taken. But the vote as recorded in the official proceedings shows that the one cent plan, after a most exhaustive discussion, was indorsed by the representatives of the roads owning a large majority of the freight cars in use. It will now go before the general managers as the approved plan of the car accountants.

Everyone knows that the present straight mileage system is inadequate and bad; yet, while nearly all railroad bodies have expressed themselves to this effect, there has been nothing but the per diem plan proposed by any of the bright minds that have searched for an improvement. Hence, it seems to follow that a per diem system of some kind is what ought to be taken up and adopted in place of that which now exists. All the statistics that have been prepared are unsatisfactory and without value, because they concern only a part and not all of the railroads. There are no figures available that will enable us to say to the American Railway Association what will be the results in dollars and cents should any per diem plan be accepted by it. When the mixed plan, providing for fifteen cents a day plus one half cent mileage, was tried, many of the roads lost thousands of dollars because the rate was too high under the existing conditions. Another plan of six cents per diem plus one-half cent mileage has been proposed, but there has been opposition to that likewise, especially by roads in the West and in the South, who aver that the rate is still too high. There are two apparent grounds for objection to any change, viz.: Our managers fear that their cars on foreign lines might earn less than they do at present; and also that other cars on home lines might cost more than they do now.

The whole per diem question is fraught with mystery. We cannot see through it until we try it, and in making a trial it will certainly be necessary to creep before we walk. Instead of starting in at a high figure, which, until details of settlement and other features are arranged, will result in loss to many roads, is it not better to adopt the lowest figure, one cent, and grow up from that, with full and accurate statistics, to a fair and permanent rate based on experience and approved by common consent?

One cent seems small, but the present mileage rate is maintained, and even the one cent would be a lever to force cars home. A superintendent would look very carefully at the apparently insignificant charge of one cent per car per day when it means that the total number of foreign cars handled in one year are to be multiplied by the total number of days they are on his track and the whole paid for at the rate of one cent per day, plus the mileage at three-quarters of a cent per mile. Look at the cars that are sent to him for grain or for furniture and are held from one to three months! Would not that cost something? It might be said in an individual case that an agent, to oblige a consignee in holding a car, would look at the idle time of the car as costing only one cent a day; but when the operating department sees that there are hundreds of cars on the road that do not run nor earn anything while they are idle, and which cost one cent each for every day of detention, every effort will be made to send those cars home promptly. At the end of a year the per diem charge may be increased, or the mileage rate decreased, or such other adjustment made as experience may show to be desirable. No man can enter a dark room where he has never been before and make his way to a given object without some source of light. Neither can a straight or mixed per diem be adopted, or any other than the present iniquitous system be used, except by gradual approaches from small beginnings. The one cent plan will be so gradual in its effects that there will be no danger of a sudden calamity in the car service revenues.

One objection that may be made to a mixed plan is the increased labor; but above all things each road must compute its car mileage, and if the per diem feature be added in any form it will essentially be that much new work. On the railroad having a greater car mileage than any other it would require perhaps four new clerks, on a few others one or two new clerks, and probably on the most of the railroads of this country it would not cost appreciably anything at all; but not, at the farthest, more than the salary of a $40 clerk, so that that objection should not have practical weight. But reforms always cost money; and this question, as important, perhaps, to revenue and traffic, as safe signaling or uniform rules are to transportation, will be cheap at $40 a month.

With a well-balanced and effectual per diem plan in operation there may come a time when the free use of common box cars will be conceded by all the roads. But that is another story. S. H. CHURCH.

Honoring an American Engineer.

The dinner and reception given to Mr. John Fritz, General Superintendent Bethlehem Iron Co., at Bethlehem, Pa., Wednesday evening, Sept. 28, was no common event. Indeed, it was extraordinary in several particulars. About 250 men were assembled who represented the best of American skill and achievement in engineering and in industrial affairs. Letters were read from Americans and Europeans of high distinction as mechanical engineers and in other walks of life. The occasion was marked by a spirit of affection and admiration which amounted almost to enthusiasm. In short, it was a tribute of which any man in the world would have been proud. The man who was thus honored was a poor farmer's boy, who had had the scantiest opportunities for school education, who grew up through a country blacksmith shop to be one of the most distinguished living mechanical engineers, and who now, 70 years old, is a sturdy, active man in the daily performance of his arduous work and whose name is known and honored over the whole world. Yet, being a man whose faculty for expression except in iron and steel is quite limited, and whose shyness and modesty have been intensified perhaps by the singleness of purpose with which he has followed his career, his name is little known to the public; but how high a place he holds in the admiration, and how large a place he holds in the hearts of the men who really know what is great in his chosen walk of life was demonstrated by the tribute that was paid to him on his 70th birthday. His career has been a typical American one, and this occasion was inspiring to all Americans, young an old, who had the great fortune to be present. Not the least characteristic feature, and one of the most charming ones, of the dinner, was the presence of a number of the subordinate officers and employés of the Bethlehem Iron Company. It was Mr. Fritz's special wish that some of these men should have a chance to share with him the honors of the evening. This little touch of humanity is a suggestion of the relations which he holds to the men who have worked under him from the highest to the lowest. It was the universal testimony of those speakers who best knew the facts, that Mr. Fritz is not only the master, but the kind and sympathetic friend, of his men.

We cannot undertake to give here even a sketch of the remarkable career of the plain Pennsylvania farmer who by his native force and talent has risen to be so known and honored. He is one of the fathers of the American iron and steel industry. He devised, and in 1857, built and started the first three-high rail mill. He was then Chief Engineer of the Cambria Iron Company. In 1860 he resigned to design, organize and build the works of the Bethlehem Iron Company, and to this day he has been the vital force in the heart of that great establishment. Within the last few years he has designed and built there one of the most important armor and gun plants in the world; of this we shall say more later. He has been the friend and counsellor of the brightest and best among the iron and steel men of the nation and was one of that brilliant group known as the "Bessemer Boys." Holly owed much to the robust and patient sense of his friend Fritz, and possibly more to Fritz's gift of humor. A room in Fritz's house was set apart as Holly's room, and is still called "Holly's room;" and we venture to say that many a time that ardent, sensitive man lay down on the restful bed in that room thanking God for the comfort and hope that stalwart John Fritz had brought to his tired soul.

The idea of this dinner to Mr. Fritz originated among his friends in the Engineers' Club, of which he is a trustee; and, while they would gladly have had the dinner

at the club in New York, they recognized the fact that it properly should be given at Bethlehem, where he had lived so long, and where he was so beloved and respected. The local committee consisted of Robt. P. Linderman, William H. Jacques, Garrett B. Linderman, W. A. Wilbur, Rollin H. Wilbur and E. H. McIlvaine, and these gentlemen carried out the details of preparing for the event. The general committee of arrangements were Eckley B. Coxe, of Drifton; R. P. Linderman, of South Bethlehem; R. W. Hunt, Chicago; Jas. Moore, Philadelphia; S. W. Baldwin, New York City; E. D Leavitt, Boston; Oliver Williams, of Catasauqua; S. T. Wellman, Thurlow, Pa., and J. F. Holloway, President of the Engineers' Club, New York.

The actual date of Mr. Fritz's birthday was Aug. 21 and it was at first proposed to have the dinner at or about that date, but so many of his friends were away on vacation, and every one who had heard of the proposed dinner pleaded so hard to have it postponed until a date when they could be present, that the committee decided to make the date Sept. 28, and it was, as it turned out, a lucky selection, for the weather was perfect. In response to something over 300 invitations, a number of which were sent abroad to engineers in Europe, about 250 people sat down to the dinner, which was laid in the Opera House in Bethlehem, which was found to be the only place large enough to accommodate the guests. The Opera House was floored over on a level with the stage, and was handsomely decorated with banners, flowers, and electrical devices. In every seat there sat a man of national reputation in the various walks of science and industry. They included a wide range of engineering and constructive talent, as well as a large number of men who, as the heads of iron and steel works, or in shipbuilding, mining, engine building, railroad management and in many other ways, made the gathering one rarely if ever before paralleled. There were also present officers of the army and navy who had come to greet the man who in a few short years had built up a plant whose productions already rival if they do not excel what has been produced in other nations after long years of experiment, and the expenditure of vast sums of money; and there could be no better example of what free institutions can do for the "plain people,"—no better example for the encouragement and inspiration of young men, than to look upon that sturdy engineer of 70 years walking erect, vigorous, with kindly face, but firm purpose, over ground which but five years ago was waste land, but now is covered with magnificent buildings filled with massive tools and appliances of the latest design, and to know that the master of it all, was born a poor boy, spending his early years on a small farm, that he had never had any of the many advantages of education now within the reach of almost any boy, that he had hewn out for himself a place that no wealth could buy, no lineage could confer.

The dinner, merely as a dinner, was a success, and the way in which Mr. Fritz was spared, what to him would have been the horrors of speech making, was especially clever. Unknown to all but a few of those present, it had been planned to convert the whole affair into a moot court, in which the guest of the evening was to be tried for various crimes and offenses. To those who know John Fritz and the vein of humor that runs through all his sayings, it will be unnecessary to add that such a proceeding, relieving him as it would from making speeches in response to speeches, was grateful. The persons who were to take part in the court scene had been placed at the various tables in such positions that when the court opened no change other than turning their chairs was necessary, and the court was at once ready to proceed to business. The Chief Justice of the court was Dr. Lamberton, President of the Lehigh University. As the Associate Justices there were ranged on either side Chas. H. Loring, President American Society of Mechanical Engineers; Geo. W. Melville, Engineer-in-Chief U. S. Navy; Henry Morton, President Stevens Institute; Wm. Sellers, President Wm. Sellers & Co.; Chas. E. Emery C. E., and John Hartman, of Philadelphia; and while it was an array of great judges they all realized that they were there to try a great man. W. F. Durfee, Superintendent of C. W. Hunt & Co., made an ideal High Sheriff in size, voice and action. The Attorney General was the Chairman of the evening, J. F. Holloway, President of the Engineers' Club of New York. John Bickinbine, President of the Institute of Mining Engineers, conducted the case on behalf of the commonwealth, while R. W. Raymond, Secretary of the Institute, was assigned by the Court to defend the prisoner, and to those who know Dr. Raymond it need not be said it was well done. On the part of the commonwealth there were also as attorneys Oliver Williams, President of the Catasauqua Manufacturing Co., and Joseph D. Weeks, Editor of the *American Manufacturer*, while Hon. J. Davis Brodhead and General Dooster assisted in the defense of Mr. Fritz. The other officers of the court were Chas. Kirchhoff, Editor of the *Iron Age*, clerk, and E. G. Spilsbury reporter. The witnesses called were R. W. Hunt, of Chicago; Samuel Thomas, of Catasauqua; E. D. Leavitt, of Boston; Robert Lockhart and others.

Before the legal proceedings began brief extracts were read from the large number of letters and telegrams received from friends of Mr. Fritz in Europe and in this country, only a part of which can be given here.

Sir Lowthian Bell, from Middlesborough, England, cabled a "message of gratitude for many acts of kindness, and earnest wishes for your future happiness," while from Dowlais, Wales, came this: "Am joining your friends, wishing you many returns of the day. Martin Dowlais." Windsor Richards, from Lowmoor, England, cabled that he "joined his American friends in doing honor to John Fritz. He is proud and glad to call him his friend, drinks to his good health and wishes him most heartily many happy returns of his birthday." John Gjers sent "hearty congratulations;" and there were cables from others, which came too late to be interpreted into our language, but which, without doubt, in the words of the lands from which they came best expressed love and respect.

From friends nearer home messages of respect and regard. Robt. H. Sayre, Jr., wired, "My congratulations; many happy returns of the day." Congressman Boutelle, from his home in Maine, sent the following: "Extend warmest congratulations to John Fritz, who has reared at Bethlehem as the enduring monument of his fame, the mightiest of all constructive hostages, for 'Peace on earth, good will towards man.'" From his warm personal friends, Jay C. Morse, Robt. Forsyth, James F. Lewis, and many others there came messages of similar import. But it was in the letters received, where the sender had a wider scope in which to express himself, that kindly thoughts were best expressed, and it is here that the limitations of space are most to be deplored. However, the following brief extracts have been culled out of a large bunch of letters which it is the purpose of the General Committee to bind in an enduring form and present to Mr. Fritz:

From Stockholm his old friend Richard Akerman writes: "Unfortunately it will be impossible for me to attend at the dinner given in honor of you, as friend and great inventive engineer, but I feel happy that I at least have got opportunity in this way openly to tell you my warm feelings of grateful gratitude for all the proofs of friendship and kindness I have from you."

From Berlin came this: "It is now more than sixteen years since that I had the honor to make your acquaintance. Then, in 1876, America, so far as its iron industry at least, is concerned, was discovered for the second time, and the knowledge which we carried home from that voyage of discovery has been of untold blessings to Germany. I join with a large number of your friends and admirers in my congratulations. I do so, not in my own name, but because I am convinced that I only express the feelings, universally, of all German metallurgists. May God give you long life, health and strength for the undiminished achievements, for the benefit not alone of your country, but also of the whole world. Dr. Herm.nn Wedding."

An extract from Sir James Kitson's letter says: "You tell me to my surprise that our friend has now attained his seventieth year; to my surprise, for as I recall that only two years ago when nearing New York at an early hour in the morning, a deputation of the Reception Committee of the Iron and Steel Trade boarded the 'Servia' and I was introduced to a 'young man by the name of Fritz,' who I presently learned was the distinguished engineer well known to me by name, and the designer of the great steel works at Bethlehem. Mr. Fritz has created a plant which does honor to your nation and is an enduring monument of his patient, persevering genius, as a scientific engineer and a metallurgical specialist."

From H. Schneider, of Le Creusot, France, there came a long and charming letter from which only a few brief extracts can now be made. "I am happy to send across the Atlantic in the name of the metallurgy of the ancient continent a cordial recognition to one who has done so much to render illustrious the industry of iron and steel and to join in spirit with the group of numerous friends who have met to give him, upon the scene of his more recent triumphs, a striking proof of the high esteem in which they hold his talents as an engineer, as well as his qualities in private life. I have never for a moment doubted that his high intelligence and indefatigable energy would surmount all the difficulties of enterprise with which he was charged, and have recently applauded the results achieved by him without being at all surprised thereby. It is but just that he who has done the work should have the glory, and when a career so well filled as that of Mr. Fritz is crowned by implanting upon his native soil a new industry of the first national importance, it is his right—forgetting his modesty for a moment—to cast a look of pride upon the work of his life. I esteem myself fortunate to number in the United States a few friends whom I hope to have the pleasure of meeting next year during the Chicago Exposition, and I am particularly happy to send to-day all my congratulations to one of those who has conferred great honor upon his country and upon our noble profession. I join with you all in wishing him a long life and health as sound as the armor plates which have come from his hands. Kindly accept, gentlemen, the assurance of my sentiments of confraternity and high consideration."

The following extract from a letter from John Kraft de-la-Sault, Engineer in Chief of the famous Cockerill Works, Seraing, Belgium, will give an idea of the esteem John Fritz is held in in that part of Europe. After expressing thanks for the invitation sent him, he adds: "Mr. Fritz is one of those men who realize in their persons the union of high mental powers, with a warm and kindly heart. Each of his visits to Europe has been a fortunate event for us, and during my stay in America I found his society a perpetual source of pleasure. I need not say how sincerely I regret not being able to be present bodily at this fête, which is being prepared in his honor; but in heart and spirit I shall be with you, and I beg you will impart to him the feelings of admiration, of esteem and friendship, I send to him from beyond the sea, and which I would so gladly have expressed personally—a pleasure which I hope the future may still afford me."

And so on from many others who in the old world have seen on the western horizon that gigantic iron and steel industry which, while yet young as years go, is colossal in results.

Similar letters came from nearer home. Senator J. B. Hawley wrote from the Senate Chamber at Washington: "Write me down in the great list of those who admire John Fritz, and even among them who knowing him best, not only admire, but love him. The humble blacksmith has become one of the kings of industry. It is written on the tomb of the great architect of St. Paul, 'If you seek my monument look around.' I walked through the shops at Bethlehem as though we were among the works of a great artist, and felt one ought to uncover in their presence."

Geo. H. Meyers, Director of the Bethlehem Iron Company, writes: "I am sure no man is more worthy, for he is, in truth, one of 'Nature's noblemen.' His life has been one of continued, uninterrupted, modest, unassuming, persistent, energetic, able and successful effort which has solved every problem, overcome all obstacles and conquered every difficulty, thus receiving honor and renown among his fellow men and the love of his friends. The impress of his genius has been indelibly stamped upon the mechanics of the present age, and the world has been benefited because he lived."

Gen. D. W. Flagler, Chief of Ordnance, U. S. A., wrote: "I appreciate the great work Mr. Fritz has done for his country, and the great work he is doing for my department, and the honor his ability, work and character confer on our country, and I am glad you will show him in the manner you propose your appreciation of what he has done and is still doing."

Letters from many others breathe the same sentiment, but the want of space does not permit even extracts from them. There is, however, one letter which, by reason of the old time friendship, happily never interrupted, between two men who have both reached the same milestone in life's journey, and by reason of a fact long known to a few but now for the first time made public, cannot well be omitted. The letter is from Abram S. Hewitt, who until the last moment had hoped to be present. It was addressed to his friend Dr. Raymond, who handed it to the committee as a contribution of one of Mr. Fritz's oldest friends. Mr. Hewitt wrote:

"My Dear Raymond: I will thank you to explain to my old friend, John Fritz, and the company assembled to do him honor, if a convenient opportunity should offer, that I have only denied myself the pleasure of joining with them in expressing the general affection in which Mr. Fritz is held by his old friends and associates, because I do not feel able to leave home without serious consequences to my health. I trust Mr. Fritz, who at seventy years is young enough to receive the festive congratulations of his friends, will be able to make allowances for the infirmities which come to some people at threescore and ten, although he is happily exempt from them.

"You know my feeling toward Mr. Fritz and the protest I interposed when the Bessemer Medal was conferred upon me instead of on him, who was so much better entitled to receive it by his contributions to the business in which we have both been so long engaged. I wish courtesy would allow me now to turn it over to him, but I think he has full compensation in the living demonstration which attends the completion of his seventieth year, while my advent to the same distinction was very properly allowed to pass unnoticed. We have made the journey of life together and now when we are at the end of it I venture to hope that I retain the friendship of a man of whom more than any other in our fraternity it may justly be said:

"'None know him but to love
None name him but to praise.'

"Sincerely yours,

"Abram S. Hewitt."

We cannot better end these selections from the letters than by this generous tribute from one noble man to another.

We shall not try to report the trial of Mr. Fritz on the charges of having deceived his neighbors, and mankind in general, by pretending to be an engineer, and by professing to be able to work in steel and iron, that he had spoiled much good farming land, had interfered with the improvement of the breed of horses in his part of Pennsylvania by occupying a race track with his mills, that he had filled the bright air of Bethlehem with black smoke and that he had spoiled the banks of the Lehigh as a promenade for the men and maidens of that neighborhood. To those who were present it will be obvious that one must have been there to appreciate the humor and spirit of the occasion. Such things may be enjoyed, but no cold type can carry the enjoyment to others. The whole proceeding was a blending of wit and humor and good feeling. At the close of the trial a review of the testimony was made by Dr. Lamberton, and, better still, a review of the life and works of John Fritz, not only as they had to do with metallurgical pursuits, but in the line of his connection, as trustee, with the Lehigh University.

As the closing remarks of the chairman of the evening, Mr. Holloway, who also acted as the Attorney General, divulged facts not generally known, but which when known were at once acknowledged to be in the line of all the acts of this unselfish man all had come to honor, we give them entire.

"May it please your honor, while it was my imperative duty to present the charges on which the prisoner has been tried, I would like to add a few words to what has already been so well said. I hope that whatever sentence you have in mind to inflict on the prisoner at the bar, that it will be tempered with mercy; that you will bear in mind that through all the long years he has spent, burdened by the cares, the anxieties and perplexities that ever surround the life of the engineer and the iron master, he has ever had a kind word for those about him. Did sickness and death come to the homes of any, he brought them words of consolation and hope; did any have heavy burdens to bear, his hand helped to lighten them; were any despondent his cheering words gave them new life, and in many to us unknown ways he has done what he could to make the world the better for having lived in it.

"I am something of a privileged person to-night, having borne a somewhat confidential relation to all concerned in arranging for what has been done here, and with your Honor's permission I would like to impart a portion of the inner history connected with the preparations made for this event. It is known to a few present that originally it was intended to have this a small dinner party at a hotel, but when the announcement was made that a dinner was to be given John Fritz by his friends, so numerous were the persons who wished to have a part in it that the hotel had to be given up, and a large hall was found too small, and this opera house was the only available large place to be had; and had the dinner been postponed a week longer we would have been obliged to build an auditorium.

"A few days ago, as you all know, Pennsylvania Avenue was filled with old and battle scarred veterans who were marching under waving banners of red, white and blue along that historic avenue, most of them for the last time. Among them was the remnant of a regiment known as the 29th Ohio, and in the ranks and beside the old soldiers, wounded as many of them were by the arrows of misfortune and poverty, there walked a man who was once their colonel, and once the President of the United States; and in the time to come, when Rutherford B. Hayes comes to be better known and better appreciated, one of the grandest tributes to his memory will be the story that on that last march of the old Veterans through the capital of the nation he took his place in the ranks, and alongside of what Abraham Lincoln was pleased to call 'the plain people.'

"And now for the secret I am to tell you: When it was announced that this anniversary dinner was to be given in this opera house the prisoner at the bar, who had asked nothing for himself, came to us and said, that if there was plenty of room and no one would be discommoded in the least he would so much like to have some of his old tried workmen, on whom he had so much relied, to have a place at the table and a part in the excursion. I need not tell you how promptly he was told that there was a place at the table and a place in all that was to be seen and heard and a warm welcome for all he chose to bring, and that to-night there are none more glad and proud at the honor shown to their chief than are the old guard of John Fritz, and when the story of his life shall be told no page will shine brighter, no incident will more truly illustrate his kindness of heart, his modesty and his thoughtful regard for others, than will the one that relates that in the hour of his greatest success, when praise and honors came to him from all sides, he turned his thoughts backward to review his past life, to remember the hours of his trials and difficulties, and in that retrospective view he did not forget the faithful men who had stood by him and helped him on, and his happiness would this night have been incomplete had they not shared his triumphs with him."

Thus was brought to a close an evening of enjoyment never to be forgotten, in which with mirth, humor and repartee, that made the house ring with cheers, and which yet had through it all a vein of earnest respect, there were many words spoken which had in them much of pathos and of thought that betokened love and admiration for an old friend and neighbor and a famous mechanical engineer. The sentence pronounced by Judge Lamberton was a "time sentence"—it was in fact that the prisoner at the bar, John Fritz, and his noble wife, Ellen W. Fritz, who, sitting in the gallery surrounded by the ladies of Bethlehem, and who had listened as only a wife could listen to the words of praise bestowed upon her husband, should be compelled to receive one of Tiffany's best tubular chime hall clocks, and as the judge waved his hand the parting curtains of the stage box revealed the gift, and as the astonished guest looked and listened the chimes, which for a hundred and more years have rung out on the midnight air in old London, were repeated in this new Bethlehem of the New World.

THURSDAY'S EXCURSION.

The party met the next morning at half-past nine for an excursion to the proving grounds and works of the Bethlehem Iron Co. A train of five flat cars was provided on which had been rigged seats, and this was drawn by a locomotive decorated with flags. The party went at once to the proving grounds, where were mounted two modern, high power rifles, one of 6 in. and one of 8 in. calibre. These guns were made in the rough at the Bethlehem works, but were finished and assembled at the Washington Navy Yard. An armor plate 13 in. thick had been placed against the backing. It was a nickel-steel plate, but had not been treated by the Harvey process or tempered. One shot was fired at it from the 6-in. gun. It penetrated about 9 in. and started four short cracks. The shot rebounded about 300 ft. and was found to be without a fracture and the point uninjured, but the metal was upset somewhat about the middle of the projectile. Very prudently no other shots were fired, as the party was too large to be properly protected.

The train then returned to the works and a deliberate and careful inspection was made of all of the new mills, that is, the gun and armor plant. The time was too short to visit the rail mills which, indeed, to many of the party, would have been an old story; but the magnitude of the new works and their magnificent equipment was most impressive. Nobody who had not actually been through them from one end to the otner had the least conception of them. Indeed it is difficult to convey an adequate idea of this great plant. The machine shop, which was first visited, is 1,260 ft. long; that is, it is but two bays short of a quarter of a mile. The party was taken through this from end to end, on the train, and as it moved slowly a very fair opportunity was given to see the tools in position and at work. The party then alighted from the train and returned to the machine shop for further examination of some of the tools. The magnitude of these can be imagined when one considers that they have to deal with forgings, the weight of which runs up into tens of tons. The heaviest forging yet made is said by Mr. Fritz to have weighed 55 tons. Here shafts, gun tubes, cranks and other great forgings are shaped and finished, and machinery is now being put in place at the lower end of the shop for finishing and assembling complete the great guns for which the company has a contract. Heretofore it has only furnished the rough forgings and the finishing and assembling have been done at the Washington Navy Yard or Watervliet.

From this shop the party went to the forging and casting shop. There they saw a 13-in. gun tube weighing 18 tons or thereabouts taken out of the heating furnace and put on a mandril under the hydraulic forging press. They had also a chance to see the pouring and casting, under hydraulic pressure, of an ingot of 40 tons of steel. From this place the party went to the oil tempering house where they saw the process of lifting an armor plate and a shaft 65 ft. long from the furnaces and plunging them in their bath of oil. The arrangement for tempering shafts and gun tubes is a vertical tank, and the tube or shaft is placed on end in the furnaces. From this it is lifted high enough to clear the tank and then lowered into the bath. The height of the building, therefore, must be twice the length of the longest shaft to be tempered, plus the clearance and room for the cranes above.

From this shop the party went to the armor plate mill where they had an opportunity to see the 125-ton hammer at work on an armor plate. The weight of the bloom was perhaps 20 tons. The hammer is 25 per cent. larger than the great 100-ton hammer at Creusot, and the 125 tons of metal which it contains has an extreme drop of 16 ft. No idea can be conveyed to the human mind of such a colossal machine, unless it be actually seen. It is stupendous. In this mill was seen also the process of bending the armor plates, which was as interesting perhaps as anything about the works. How powerful and yet how delicate this work is can be imagined when it is said that the plates are sometimes 18 ft. long, 6 ft. wide and 13 in. thick, and these immense masses of metal must be hammered in the first place to a uniform thickness, which is not allowed to vary in any part more than one-sixteenth of an inch either side of the prescribed thickness. The same extreme accuracy is specified for the bending. The curve of the plates is not allowed to vary more than one-sixteenth of an inch either way from the curve of the template or drawing furnished by the Navy Department, and these curves are not always mathematical ones but the plates have to be bent to arbitrary curves and warped surfaces. One would think that such refinements are unnecessary, for they are probably greater than can be reached in putting the plates in position on the ships. Of course, great ingenuity must have been used in arranging all of the machinery so that it can be operated with the least expenditure of human labor. One of the party saw a man swinging a heavy sledge hammer, and was at once struck with the thought that this was the first man he had seen in the whole plant doing hard work.

Incidentally it may be said that the Bethlehem company is learning a good deal about nickel steel, and some very remarkable results have been obtained. At least one specimen was tested which, with a tensile strength of about 93,000 lbs., showed 42 per cent. of elongation; but properly enough much that has been done and many of the means of doing it are kept secret, and although the scientific world would be immensely interested in a thorough and detailed account of this great plant and of its work, the time has not yet come for publishing such an account.

After the visit to the works, the company took luncheon in the drafting room, where there was more talk and more enthusiasm, and then they separated, going to their homes wiser men for all that they had seen, and better men for having taken part in this noble tribute to a high and simple character and to a man who, by his achievements, his modesty, and his sincerity, has added luster to the engineering profession and glory to the nation.

At the end of the mock trial Dr. Raymond read the following verses:

JOHN FRITZ.

Whom shall we choose the flag to hold
In our vast conquest, yet untold,
Which to the New World adds the Old?
Donner und Blitz!
John Fritz!

Leaders unseen are with us yet;
Nor they, nor we the past forget.
The fate that took them early, yet,
Thank God, omits
John Fritz!

When doubters doubted whether we
Could beat our brethren over sea
In rolling mill machinery,
Who gave 'em fits?
John Fritz!

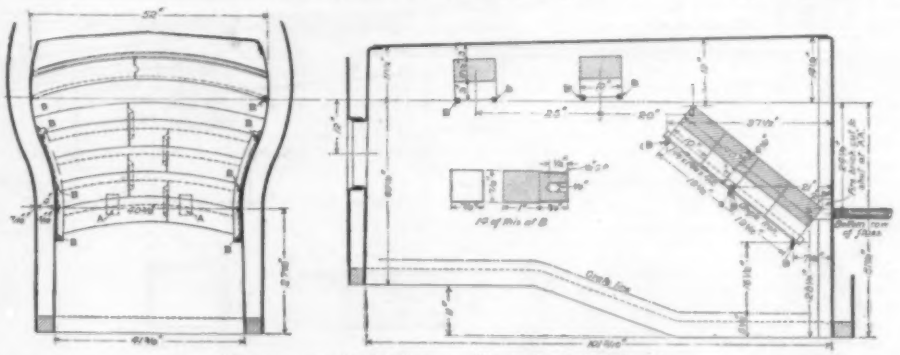
Who stands before us to combine
A level head, an upright spine,
With nowhere any crooked line?
Most clearly it's
John Fritz!

Whose heart is warmer than his blast?
Whose faith more steadfast to the last
Than any steel he ever cast?
That figure hits
John Fritz!

Whose fame commands our homage, such
As bears of envy not a touch,
Because we love the man so much?
Why, there he sits—
John Fritz!

Brick Arches, Illinois Central Railroad.

The Illinois Central Railroad has received a large share of the attention of the Society for the Prevention of Smoke in Chicago, probably on account of the prominent position of its tracks and the extent of its surburban service, and has been making special efforts to prevent smoke. All of its engines have been fitted with steam jets of some one of the types approved by the smoke officials, but as these are only fairly satisfactory, the use has been begun of an extra brick arch and of a deflecting furnace door.

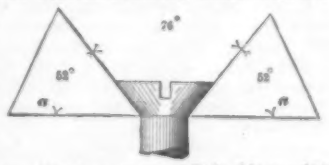


Arrangement of Brick Arches—Illinois Central Railroad.

Our illustration shows the arrangement of the brick arches as applied to a locomotive with a long firebox. It will be seen that in addition to the ordinary inclined fire brick arch there are two arches which are but 10 in. wide placed nearer the furnace door, as shown in the drawings. In a short, deep firebox but one of these arches is used. This arrangement has proved very satisfactory in preventing smoke and has also been productive of considerable economy in coal, and is being put in in one form or the other in all of the Illinois Central engines which enter the city as rapidly as the shop facilities and the volume of traffic will permit.

The Angle of Countersunk Heads for Machine Screws.

The *American Machinist* has been investigating the present practice in the manufacture of countersunk head machine screws in the hope of establishing a standard, but finds there is no agreement among manufacturers. The accompanying cut was made from a blue print, concerning which the Brown & Sharpe Manufacturing Company writes to our contemporary: "This blue print represents exactly the drawing made in 1856, when this angle, 78 deg., was adopted by Mr. Jos. R. Brown as our standard, after conference with some of the leading screw makers of that day. A gauge was made at that time by J. R. Brown & Sharpe, the name of the firm under which our business was then transacted, for the New England Screw Company, and we are informed that this gauge is still in use in connection with some of the products of the company which succeeded to the business of the New England. We have found the angle satisfactory for our own work, and we are inclined to think that it would be equally satisfactory for general use. This opinion is confirmed by that of the president of one of the largest screw manufacturing companies in the country." We quote the concluding remarks of the *American Machinist:*

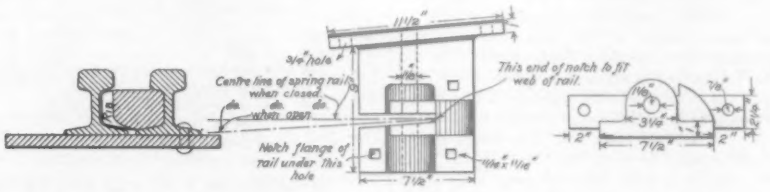


"It is to be regretted that there is no uniformity in this matter, and we do not know that anything can be done to secure it, unless manufacturers can agree upon something, which seems unlikely. It occurs to us, however, that for machine shops a standard might be established, and as the angles given by the engraving above are those of a gauge which was adopted after consider-

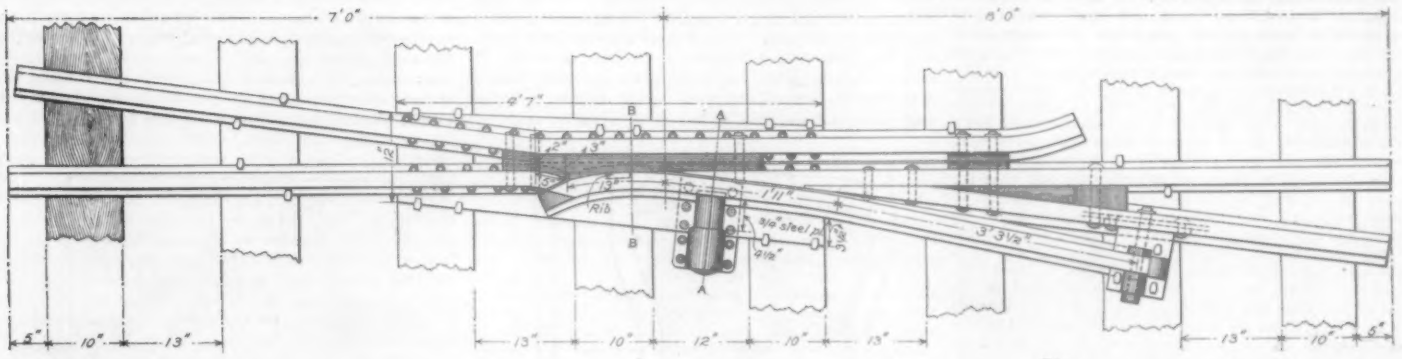
able study of the matter, and has been and is still extensively used, it would seem to be a good plan to conform to them, and so far as possible, in machine shops at least, make all such screws, and order those purchased to conform to it."

The Vaughan Spring Rail Frog.

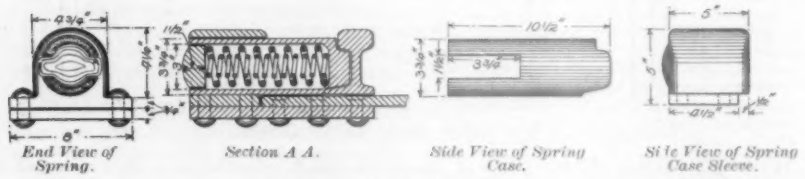
The very complete drawings show in general and in detail a frog which was patented last May, and which has been used for some time on the Pennsylvania Railroad. It is called the "Vaughan Stiff Rail Frog." It is shown so completely that description is unnecessary. The radical departure is in the movable rail, which, it will be noticed, swings from what is usually the free end, and which is made much shorter than in ordinary practice. Concerning this frog, the following letter from Mr. M. W. Thomson, Engineer of Maintenance of Way, Pennsylvania Railroad, has been handed to us.



Section B B, Showing Rib. *Plan of Chair.* *End View of Chair.*



Plan.



End View of Spring. *Section A A.* *Side View of Spring Case.* *Side View of Spring Case Sleeve.*

THE VAUGHAN SPRING RAIL FROG.

"The Vaughan stiff spring frog has proved in every way satisfactory on our road. For two or three years we had abandoned the use of spring frogs for the reason, mainly, that the spring rail was frequently pushed out when the badly worn wheels passed over the frogs trailing. In the Vaughan frog we seem to have eliminated this element of danger entirely, and as the construction is quite as simple as in the old style frog, it seems probable that it will come into general use wherever its merits are known."

The Central Oil and Supply Co., of New York City, are sales agents for this frog.

Preliminary Tests of the Purdue-University Locomotive "Schenectady."

BY PROF. WM. F. M. GOSS.

It will be remembered by those who have followed these pages* that the Purdue locomotive is mounted in the laboratory in such a way that it may be fired and run under conditions similar to those of the track. The locomotive is of eight-wheel type, built by the Schenectady Locomotive Works, and its principal dimensions are as follows:

Diameter of cylinders in inches	17
Stroke, in inches	24
Diameter of drivers, inches	63
Weight on drivers, pounds	53,000
Total weight	85,000
Area of grate in sq. feet	17.2
Diameter of boiler, in inches	54
" tubes "	2
Length " " " feet	11.5
Number " tubes	200
Heating surface in firebox in sq. ft.	121
" " " tubes "	1,046
Total heating surface "	1,167
Diameter of exhaust nozzles in inches	3

The drivers rest upon supporting wheels, the arrangement being such that when the drivers are made to turn, the supporting wheels turn with them by rolling contact. The shafts of the supporting wheels run in fixed bearings, and carry friction brakes which furnish the load for the engine. The plan of mounting provided for four friction brakes; two only have as yet been put in place. A dynamometer attached to the drawbar serves to indicate the pull and to limit horizontal motion to a very small amount. The injectors draw their supply from a small tank into which water is weighed from tanks on scales.

The series of tests herein considered was undertaken by Messrs. W. C. Wickersham and G. E. Parks, students in the laboratory, and that which is presented is virtually an abstract from the theses which they prepared. In taking observations, they were assisted by members of the junior and senior classes detailed for the purpose. The tests constitute the first work that was undertaken with the plant. Both the locomotive and the mounting machinery were entirely new, and the novel character of the latter made it an element of uncertainty until the attendants had had a considerable amount of practice in its management. All this led to some lack of constancy in the conditions prescribed and to limitations which hereafter will not be necessary. Indeed it was not expected that these early trials would be of value outside of the laboratory in which they were obtained, but a review of the data discloses much that is of interest.

The plan was to conduct such a series of tests that each one of the series would give a complete record of the locomotive's performance. The conditions for each test were to be different from the preceding only by a change in the cut-off, the speed to be controlled by throttling. It was endeavored to maintain the steam pressure constant at 130 lbs. The safety valves, which were set at 140, did not open during any of the tests, and a variation of five pounds, either side of the selected pressure, did not often occur. The quality of the steam was determined by use of a throttling calorimeter attached to one of the steam pipes in the smoke-box, about half way between its connection with the dry pipe flange and the cylinder casting. All outside parts of the calorimeter were well protected from radiation, and the very short pipe connection within the smoke-box was heavily covered with asbestos board. The draft was measured by a U-tube; this was attached to the side of the smoke-box. The temperature of the waste gases was found by means of a copper ball, which, after being exposed in the smoke-box at a point near the centre of the tube sheet and at about two inches distant from it, was, by a suitable arrangement, allowed to roll down an inclined pipe into the water of a calorimeter. From data thus obtainable the original temperature of the ball was calculated. During each test about three determinations were made, the average result of which is given below.

Indicators were attached to each end of each cylinder and four cards were taken at the same instant. All data given, depending upon the indicators, are based upon the average obtained from all the cards taken. The indicator rigs were temporary, and their motion was a fairly good approximate one. The coal used was Brazil (Ind.) block. The firing for all tests was done by one person, who, however, was without previous experience on this particular engine.

In making a test the engine was first started and run until the conditions of the test were had, the fire meanwhile being kept as thin as could be well maintained. When all was ready, the gong was struck, all conditions noted and the test was considered as begun. Observations, excepting those in connection with the temperature of waste gases, to which reference has already been made, were taken every ten minutes. The tests were ended by a stroke of the gong, with an allowance of about five seconds after the gong in which to take final observations before the closing of the throttle.

In every test, owing to causes already referred to, it was found necessary to make one or two intermediate stops. The longest stop thus made was one of nine minutes in the first test. The average of all the others was about seven minutes. These intermediate stops were made by closing the throttle a few minutes after one of the regular 10-minute gongs and then noting the time when the wheels ceased to turn. The starting time was taken the instant the engine moved again, and a sufficient period was allowed to elapse before the ringing of the next regular 10 minute gong to make the running interval 10 minutes. Excepting for these intermediate stops the throttle generally was not moved during a test.

It was intended to maintain a constant stress on the drawbar of 2,500 lbs., but near the close of the series a fault in the adjustment of the dynamometer was discovered, which laid the whole of the preceding record open to question. For this reason the dynamometer readings for the series is omitted. The data for the tests appear in the table.

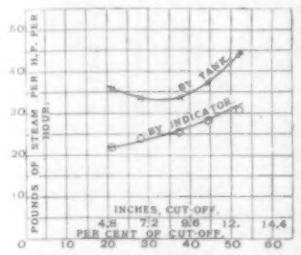
The quality of the steam in the boiler is not given in the data. As already stated, the calorimeter was connected with the steam pipe in the smokebox and consequently the results derived from it show the quality of the steam in the dry pipe. When, however, this is known and when the pressure in the dry-pipe and in the boiler are known the quality of the steam in the boiler may be easily calculated. Such calculations for the five tests given show the steam in the boiler to have contained less then one per cent. of moisture. If the plan of the tests had been carried out perfectly the mean effective pressure would probably have been constant

Number of Test.	1.	2.	3.	4.	5.
Date of test	Apr. 21	Apr. 22	May 2.	May 3.	May 4.
Duration of engine test in minutes	170	180	180	180	180
Total number of revolutions	13,440	14,530	16,935	14,490	14,116
Revolutions per minute	79.05	80.72	94.08	80.50	78.42
Number of miles equivalent to total number of revolutions	41.87	45.24	52.77	45.15	43 68
Miles per hour	14.76	15.08	17.59	15.05	14.56
Cut-off in inches	12 5	10.7	9.	6.8	5.1
Cut-off, per cent. of stroke	52.	44.6	37.4	28.3	21.2
Release, per cent. of stroke	86.	82.7	79.2	72.7	67.9
Beginning of compression, per cent. of stroke	25.1	26.5	34.4	41.8	43.5
Boiler pressure by gauge	129.5	132.	128.8	131.7	131.2
Pressure in dry pipe, by gauge	42.1	52.4	60.9	73.5	94.16
Average mean effective pressure	28.46	29.74	27.9	27.09	25.04
Indicated horse power.	121.9	130.	141.6	119.3	119.2
Total weight of dry coal	2,231	2,118	2,112	1,863	1,771
Total weight of ash and non-combustible	213	158	192	193	183
Total weight of combustible	2,018	1,960	1,920	1,676	1,588
Weight dry coal per square foot grate per hour	45.8	41.05	40.9	36.2	34.3
Draft in inches of water	1.35	1.22	1.	0.92	0.91
Temperature of smoke-box F	616	605	614	546	556
Number of times injector was started	17	23	20	18	18
Number of minutes injector was in action	70	67	65	62	62
Temperature of feed water	57.7	59.2	58.8	57.9	58.
Pounds of water delivered to injector	14,708	14,739	14,382	12,163	12,979
Pounds lost by overflow from injector	122	165	144	126	95
Pounds of water evaporated	14,586	14,574	14,238	12,037	12,884
Pounds evaporated per pound of dry coal	6.53	6.88	6.74	6.44	7.27
Equivalent evaporation from and at 212°	7.37	8.28	8.11	7.11	8.77
Pounds evaporated per pound of combustible	7.22	7.43	7.41	7.18	8.11
Degrees (F.) that steam at the pressure supplied the engine was superheated	26.5	19.	12.9	5.2	0
Per cent. of moisture in steam supplied engine	0	0	0	0	0.49
Pounds of steam per indicated horse-power per hour	42.2	37.4	33.5	33.6	36.
Pounds of steam per indicated horse-power per hour as shown by the indicator	30.8	28.3	25.4	27.3	21.6

* See *Railroad Gazette*, May 20, 1892.

for all. An inspection of the data will show that this result has been quite nearly attained. The fluctuations in speed resulted chiefly in varying the amount of power developed, but those changes are not sufficient to vitiate the tests for the purposes of comparison.

It will be seen from the diagram, which is constructed from the data given, that the lowest steam consumption, as obtained by weighing the feed water, is at about one-third stroke; that shortening the cut-off after this point is reached results in increased consumption. Also that the steam consumption as shown by the indicator continues, as would be expected, to decrease as the cut-off is shortened, up to the shortest point experimented upon. A comparison of the two curves in the diagram furnishes a good basis from which to judge of the losses brought about by cylinder condensation.

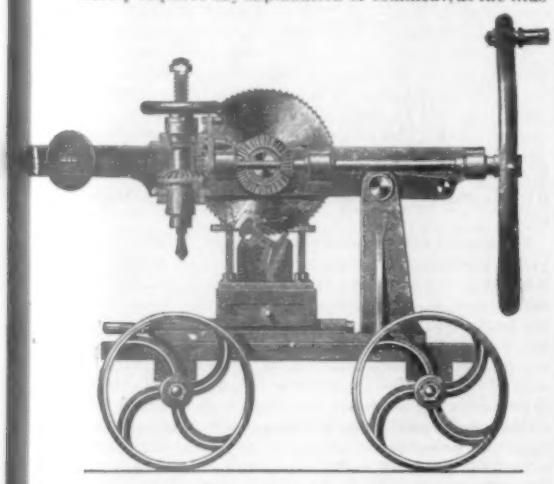


Steam Consumption for Different Points of Cut-Off.

It is, of course, hardly necessary to add that if either the load or the speed were greatly changed it would be expected that the most efficient point of cut-off would also change. If the engine should be worked more nearly to its full capacity it is likely that the cut-off might with advantage be much less than one-third stroke, and also that the steam consumption per horse power per hour would be smaller than that which is herein given.

A Portable, Hand, Cold-Sawing Machine.

The machine that we illustrate, which is made and sold by Gustave Erhardt & Sons, of Pittsburgh, Pa., hardly requires any explanation or comment, as the illustration shows just what it is. It is obviously a very convenient arrangement for cutting and drilling rails or other shapes. The makers say that it is warranted to cut a steel rail in from 8 to 15 minutes and to bore it for bolts in 5 minutes. As a rule, the blades will cut from 100 to 150 rails before resetting. The machine is furnished with or without the drill press and with or without the truck.



The Eberhardt Portable Rail Saw and Drill.

The Liverpool Overhead Railroad.*

The Liverpool Overhead Railway under discussion is composed almost entirely of wrought iron. The line, now approaching completion, traverses the whole length of the famous Liverpool docks, a distance of about six miles. The extensions north and south authorized last session go beyond the docks and away from the river in order to give better access between the residential neighborhood reached by them, the docks and the heart of the city.

With the exception of a short length where the line passes under the Lancashire & Yorkshire Railway coal sidings, the railway is, as its name indicates, overhead, and for the most part just over the lines of the original Dock Railway, which is upon the surface. The latter railway serves for the distribution of goods by horse traction, and has been used also by passenger omnibuses, with specially constructed wheels to enable them to leave the track when necessary. They will leave the rails altogether upon the completion of the Overhead Railway, which will afford a means of transit at least three times as rapid when the Dock Railway will be available exclusively for goods.

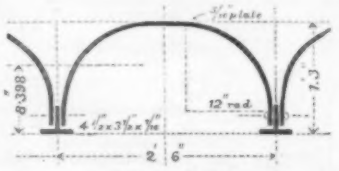
The Overhead Railway consists generally of plate iron girders supported upon channel iron columns, and carrying an iron flooring, upon which the permanent way is laid direct, without the usual intervening ballast. The normal spaces are 50 ft., but there are some of 100 ft., with bowstring girders, and others of special construction for opening and affording a passage to the docks for exceptionally bulky goods, such as marine boilers, &c.; thus there is a tilting bridge near the Sandown Dock, and a swing bridge of novel construction, and worked hydraulically, crossings the entrance to the Stanley Dock. This is the only dock entrance crossed by the railway, the other docks being on the river side of it.

*A paper read before the Iron and Steel Institute, Liverpool Meeting, 1892, by Mr. J. H. Greathead, Mem. Inst. C. E.

The columns are grouted into cast iron sockets, bedded in and bolted to masses of concrete, forming the foundation.

With the exception of some half dozen spans, the line has been constructed without the use of scaffolding, and with very little interference with the traffic, either of the docks or of the streets. This important end was attained by adopting a construction which admitted of each span and its flooring being put together at one end and transported as a whole over the already completed portion of the railway. A depot was established at the north end of the railway, where the flooring was constructed and riveted together and to the main girders. The whole span was then raised by jacks; a steam bogey with wheels running upon the two rails nearest the main girders, and thus having a gauge of 16 feet, was run under the span, which, being lowered upon the trolley, was carried by it at such a level as to clear the main girders to the southern end of the structure. Arrived at this point, the span was slung upon a movable gantry, and by it deposited upon the columns prepared to receive it. In this manner span after span was added, as many as ten being placed in a week, representing a length of 500 feet of railway.

The decking is of arched plates, finishing to 2 ft. 6 in. wide and 12 in. deep, made water tight by asphalte placed in the V-channel between the arches; this form of flooring (known as Hobson's arch plate system), first used on this railway, is being extensively used elsewhere. It is for its weight of great strength and stiffness, and is readily made water-tight. The boring is made of ordinary iron plates and tees. The plates are 46 in. wide by $\frac{5}{16}$ in. thick, and vary in length from 22 to 27 ft. The tees are $4\frac{1}{2} \times 3\frac{1}{2} \times \frac{7}{16}$ in. section, and are lengths corresponding to the plates.



Cross Section.

In order to ascertain the exact strength of the floor, some actual sections were tested to destruction, and the deflections at each increase of load were carefully tabulated with the following results:

Test.—(*a*). Three sections of floor measuring 7 ft. 6 ins in width. (*b*). Span, 22 ft., ends resting upon supports. (*c*). Load distributed over four points corresponding with the positions of the rails.

Test Load.	Deflection at Centre.
30 tons	nil
35 "	¼ inch.
40 "	⅜ "
50 "	½ "
60 "	⅝ "
70 "	¾ "
80 "	1⅛ "
90 "	1¼ "
100 "	1⅜ "
110 "	1 " (limit).

The floor plates ultimately collapsed by the total rupture of the T-irons at 163 tons, and with a deflection of 10 inches.

It is hoped that members may be able to see the actual construction of the decking at the north end. A short description may, therefore, be of interest. The flat plates are delivered sheared to exact length and width. Six of them at a time are heated in a long oven (to a cherry-red heat), whence they are separately hauled out endways into a hydraulic press, which bends them to the required shape. After cooling upon a grid or frame, where they are tightly held to prevent change of form, they are taken to a multiple drilling machine, which drills the requisite rivet holes (about two hundred) in two operations and in 15 minutes. After the end angle irons, for attachment to the main girders, are added, the decking is completed by riveting mechanically the covered plates to the T-irons forming the lower member. These combined operations are performed at the rate of 40 to 45 plates per day.

There are to be 14 stations. They are built upon iron girders and columns, the platforms being about 115 ft. in length by 12 ft. wide, and are 3 ft. above rail level. Access to the platforms is gained from the street level by four staircases at the more important stations, and on each platform a waiting shed is provided with pay offices and turnstiles.

An extensive carriage shed is erected near the Hornby docks, with five lines of way running through at the same rail level as the main structure of the railway, and underneath, on the ground floor, is the repairing shop, to be equipped with the necessary tools.

The railway is to be worked by electricity, generated at a station, for which twelve of the arches, forming the viaduct which carries the coal sidings of the Lancashire & Yorkshire Railway, have been appropriated near the Bramley Moore Dock, and about the middle of the line. At this station are three engines, each capable of working up to four hundred indicated horse power, and each driving a separate Elwell-Parker dynamo. The electricity will be carried north and south along the railway by a steel conductor, placed on porcelain insulators, supported upon cross timbers between the rails of each line. Hinged collectors, of cast iron, sliding upon this conductor, will make the connection between the motors upon the train and the dynamos at the generating station. The motors are not placed (as on the City & South London Railway) upon a separate locomotive, but are carried by the passenger carriages themselves.

A train will consist of two carriages, each to seat fifty-six passengers, and provided with a motor at one end. The carriages will be so coupled as to give a motor at each end of the train, and the motors will be so connected together as to be controlled from either end by the driver, who will always travel at the front end, changing ends upon arrival at a terminus, and carrying with him a key without which the motors cannot be operated.

All the carriages will be exactly alike, and will contain compartments for two classes of passengers, with through communication from end to end of the train under the control of the guard. A train loaded with passengers will weigh about 40 tons. The trains will be lighted by electricity, and are fitted with the Westinghouse brake, deriving its compressed air from a reservoir on the train, the reservoir being charged after each journey. This system of working the brakes has been found to answer well on the City & South London Railway. The generating station will contain at first six boilers of the Lancashire type, each 30 ft. long by eight feet diameter, with a working pressure of 120 lbs., and stoked mechanically. The engines are horizontal, compound, condensing, by Messrs. John Musgrave & Sons, Bolton. It is intended to commence running with a five minutes' service of trains, but the generating plant is designed to be capable of working a three-minutes' service, and the journey from end to end of the railway (inclusive of stoppages) to be performed in half an hour. There are 13 stations upon the dock portion of the line, and a novel feature of the railway will be a system (Timmis') of automatic signals at all the intermediate stations, in place of the ordinary signaling arrangements. These signals will be electrically worked by the trains themselves, and considerable saving in the working expenses will result.

The permanent way is of a novel construction. Longitudinal sleepers, resting directly upon and keyed to the arched decking, support the rails and the electric conductor. As already stated, there is no ballast between the permanent way and the structure, and the working charges in connection with the maintenance and repair of the permanent way should be exceptionally light.

The total cost of the railway, including equipment, will be about £80,000 per mile. Mr. J. W. Willans is the contractor for the works, and the Electric Construction Corporation, Limited (Wolverhampton), are providing the electrical equipment and the carriages. The engineers, Sir Douglas Fox and the author, have been represented on the work by Mr. Francis Fox and Mr. S. B. Cottrell, and Mr. F. Huddleston has had charge of the work (for Mr. Willans), to whom is due the credit for the design of the tilting and swing bridges referred to. It is intended to open the line for traffic very shortly.

Curve Resistance.

Among the most interesting papers which appear in the last issue of the "Bulletin de la Commission Internationale du Congress des Chemins de Fers," are those dealing with the passage of vehicles round curves. The subject had previously engaged the attention of the Congress, and in the volume of their Proceedings for 1889, is to be found a very valuable and interesting article on the subject by Mr. D. Banderali, of the Northern Railway of France. This paper, however, dealt mainly with the various details of construction, such as bogies, Bissel trucks, radial axle boxes, which have been adopted from time to time with a view of facilitating the passage of vehicles round curves. A theoretical discussion of the question is also given, and in summing up the author concludes that bogie or Fairlie engines may be advantageously used on all lines in which the minimum radius of curvature is less than 500 metres (1,640 ft.), unless the requisite tractive power can be obtained with an engine having a short wheel base, in which case the bogie becomes a useless complication. For easier lines and for high speeds, the bogie engine is still to be preferred, but six-wheeled carriages having more or less play in the axle-boxes work very well on such lines, and bogie carriages should only be used when the traffic is of such a nature that these necessarily large vehicles can be usually filled. These latter have, however, the advantage of being capable of being run on any line whatever and of being easily kept in repair.

The above conclusions, however, appear to be much in the nature of "pious opinions," and engineers of equal authority with M. Banderali assert that they have found no advantages to result from using bogies, which they condemn as useless on ordinary lines, but at the same time on a very bad line they would all, without exception, we believe, use bogie rolling stock. Indeed, such stock has frequently been driven at 40 miles an hour on an unballasted line, without accident. This being so, the advocates of the bogie assert that the device, which is a necessity on a bad road, is naturally also advantageous on a good one, but the logic is not conclusive, and, further, exact data of comparison were required.

Indeed, very little was positively known as to the effect of curves on increasing resistance till the French Government organized a series of experiments on the subject in the November of 1890. These experiments are not yet completed, but a *résumé* of their principal results so far obtained is given by M. F. Lancrenon and M. le Chatelier in the last issue of the "Bulletin." Previous experiments had been made neither with sufficient care nor with sufficient completeness to afford accurate data. Indeed, the problem is not an easy one, as the results are much affected by the atmospheric conditions. In one instance the resistance of the same train, running over the same piece of line and in the same direction, was doubled after an hour's interval. Wind is particularly injurious, but a fog also makes a great difference to the ease with which a train rounds a curve, as it lubricates the rails. Moreover, the results of the traction dynamometer usually used cannot be employed without correction, as by its means no account is taken of the acceleration of the train, some of the stored-up work in which is expended by the speed being lessened on entering a curve, the resistance of which it helps to overcome. No account of this is taken by the traction dynamometer. The French Commission proceeded on a different plan, and made use of an instrument invented by M. Desdouits. This consisted essentially of a pendulum hung on the car to be tested. When the car runs at constant speed the pendulum hangs vertically, but at each change in the velocity it lags behind or advances, in reference to the car, by an amount proportional to the rate of acceleration. The pendulum is provided with an autographic arrangement by which it records its displacement on a traveling band of paper, and from this record the resisting forces on the car at different parts of the line can be calculated. In their experiments the Commission either gave a car or train, as the case might be, a certain velocity, and then let it run on till it came to rest, or drew a train over the line by an engine, the power exerted by which was kept as constant as possible. The changes in velocity were then a measure of the resistances overcome. M. Desdouit's apparatus was thoroughly tested, and the Commission satisfied themselves of its accuracy, but as a check electric chronographic records of the times of passing over each successive 10 metres of track were taken, together with readings of an ordinary traction dynamometer. The experiments of the committee were made on a number of the French standard gauge lines, in one of which curves as sharp as 82 ft. radius were obtainable, but the most important results were got on a length of line specially constructed for the purpose at Nouy-le-Sec. The line consisted of a tangent followed by 90 metres of a curve of 300 metres radius, then 235 metres of tangent, then 100 metres of a curve of 200 metres radius, then 250 metres of a curve of 150 metres radius, then 150 metres of a curve of 100 metres radius, then a tangent of 201 metres, then 82 metres of a curve of 150 metres radius, followed

EXPERIMENTS ON THE RESISTANCE OF RAILROAD CURVES.

Type of rolling stock experimented with.	Date.	Conditions under which experiment was made.		Curve of 656 ft. radius.			Curve of 492 ft. radius			Curve of 328 ft. radius.		
				Mean speed. Miles per hour.	Mean resistance. Pounds per ton.	Increased resistance due to curve.	Mean speed. Miles per hour	Mean resistance. Pounds per ton.	Increased resistance due to curve. Pounds per ton.	Mean speed. Miles per hour.	Mean resistance. Pounds per ton:	Increased resistance due to curve. Pounds per ton.
P. O. locomotive, No. 601, six-coupled, weight 38.6 tons.	February 17	Rear axle fixed	No superelevation	14.9	.....	8.5	13.7	.....	13.0	14.3	.....	17.7
	" 26 to March 9		Superelevation of 3.16 in	14.9	.....	6 2	14.3	.....	9.2	13.7	.....	17.5
			" 6 32 "	16.2	.....	4.5	16.8	.....	7.3	16.2	.....	9.8
Ditto	Feb. 17 and 19	Front and rear axles fixed	No superelevation	14.9	.....	8.4	14.3	.....	12.3	13.0	.....	17.9
	February 26 to March 9		Superelevation of 5.16 in	13 7	.....	4.7	13.7	.....	8.3	13.6	.....	14.6
			" 6.32 "	18.6	.....	5.6	18.6	.....	7.8	18.6	.....	10.3
Ditto	February 19 to March 9	Front axle fixed	No superelevation	16.2	.....	7.2	14.9	.....	11.2	14 3	.....	15.9
			Superelevation of 3.16 in	19.3	.....	5.04	19.9	.....	7.6	19 3	.....	10.8
	Feb. 17 and 19	No axle fixed	No superelevation	14 9	.....	9.0	14.9	.....	13.0	14.9	.....	16.8
Ditto	February 26 to March 9		Superelevation of 3.16 in	17.4	.....	5.6	16 8	.....	9.0	16.8	.....	14.3
			" 6.32 "	19.9	.....	6.3	20.5	.....	8.5	20.5	.....	12.3
	Feb. 17 and 19	Rear axle fixed	No superelevation	15.5	.....	8.5	14.9	.....	11.2	14.9	.....	16.2
P. O. locomotive, No. 1182, eight-coupled. Weight 50 18 tons.	February 26 to March 9		Superelevation of 3 16 in	17.4	.....	5.0	17.4	.....	7.6	17.4	.....	11.4
			" 6.32 "	15.6	.....	4.7	15.5	.....	6.9	16.2	.....	10.1
	Feb. 17 and 19	First, second and rear axle fixed	No superelevation	17.4	.....	8.5	16.2	.....	11.9	15.5	.....	15.9
Ditto	February 26 to March 9		Superelevation of 3.16 in	16 2	.....	6.5	15 5	.....	9.0	14.3	.....	11.6
			" 6.32 "	14 3	.....	3.1	14.3	.....	4.5	14.9	.....	7.4
	Feb. 17 and 19	No axle fixed	No superelevation	16.2	.....	9.0	15.5	.....	13.0	16.5	.....	18.4
Ditto	February 26 to March 9		Superelevation of 3.16 in	17.4	.....	6 3	17.4	.....	9.5	16.2	.....	14.6
			" 6.32 "	16.9	.....	4.3	16.2	.....	5.8	15.5	.....	8.4
P. L. M. locomotive, No. 4302, eight-coupled. Weight 57.1 tons.	February 26 to March 9	Rear axle fixed	" 3.16 "	19.9	.....	6.7	19.9	.....	10.3	19.9	.....	13.7
			" 6 32 "	14.2	.....	4.5	14.3	.....	7.3	14.9	.....	10.5
	February 26 to March 9	No axle fixed	" 3 16 "	14.3	.....	5.8	15.5	.....	8.4	14.9	.....	13.6
Ditto			" 6.32 "	19.3	.....	4 9	18.6	.....	7.3	12.0	.....	11.2
Eastern Railroad locomotive, No. 7758, six-coupled. Weight 36.6 tons.	February 19 to Feb. 26 and 27 to March 9	.....	No superelevation	14.3	.....	6.9	14.9	.....	10.7	14.9	.....	15 2
		.....	Superelevation of 3.16 in	18.0	.....	7.4	18.0	.....	10.3	17.4	.....	13.2
		.....	" 6.32 "	21.1	.....	4.7	21.7	.....	8.7	21.7	.....	13.4
Eastern Railroad locomotive, No. 801. Bogie, four-coupled. Weight 55.89 tons.	January 13	.....	No superelevation	27.9	.....	4.3	12 0	.....	5.5	13.0	.....	10.6
Western Railroad locomotive, No. 951. Bogie, four-coupled. Weight 47.8 tons.	" 13	.....	"	23.6	.....	3.4	20.5	.....	7.8	15.5	.....	11.8
Six second-class carriages of Eastern Railroad, wheel-base of each, 14.8 ft.; length over buffers 26 ft. 3 in.; tare, 10 tons each.	February 20 to " 27 to March 11	.....	"	26.7	20.2	8.4	22 4	24.6	14.5	15.5	38.6	29 8
		.....	Superelevation of 3.16 in	28 6	19.6	8.5	24.2	22.4	12.5	19.3	28.0	17.5
		.....	" 6.32 "	32.9	17.0	6.9	29 2	27.1	17.3	24.2	30.8	21.8
Nine wagons of Northern Railroad, axles 10 ft. 5 in apart; length over buffers, 23 ft. 6 in.; weight, 9 tons.	February 20 to March 11	.....	No superelevation	23.0	19.0	6.2	19.9	22.4	9.6	14.3	32.0	20.7
		.....	Superelevation of 6.32 in	28.0	15.1	5.0	24.2	23.5	13.7	18.6	27.1	9.4

by 164 meters of tangent. The line was laid with steel Vignoles rails, weighing 60 lbs. per yard, and 26 ft. long. The whole of the line was level, and initially no superelevation was given to the outer rail on the curves, but afterward the outer rail was raised to 3.2 in. above the level of the interior one, and still later to 6.4 in.

Observations were made as to the way in which the wheels touched the rails by placing a thin sheet of zinc on the rail in front of the wheel and removing it after the wheel had gone over it. An automatic apparatus was used for this purpose, as it was found that it could not be done quickly enough by hand. Both the elastic and permanent deformations of the line were also noted. Nearly every type of engine and cars used on the French railways was experimented with. The table on the next page gives a summary of some of the results obtained.

The first three engines in the table were fitted with apparatus allowing a certain amount of play longitudinally to the leading and trailing axles of the engines, and it is noteworthy that this arrangement, so far from decreasing the resistance of the engine on running round the curves, rather augmented it, as the resistance was lower when these axles were fixed so as to prevent these devices from acting.

Very many more experiments were made than we have space to deal with here. Thus the effect of greasing the rail or wheel flanges was studied, and found to result in a notable decrease of the resistance. Various forms of tires were also tested, and it was found that cylindrical tires, and tires coned to 1 in 20 as usual, gave equal resistances so far as they were tested, but increasing the coning to 1 in 10 reduced the resistance materially, though these experiments were confined to the series in which there was no superelevation of the outer rail. Tires shaped to correspond with badly-worn tires showed a great increase in the resistance. When, on the other hand, the usual circular fillet between the flange and the wheel was replaced by a conical surface, the passage of the wheels round the curves was considerably facilitated, the resistance due to the curve being only about two-thirds of what it was with the normal forms. Bogie carriages were not found to have a less specific resistance to passing round curves than cars of the ordinary type, but greater if anything. The two trucks appeared to act as two separate cars of the ordinary type with very short wheel bases, which is unfavorable to the passage of the car, as the tendency to jam increases with the shortness of the base. The effect of speed in modifying resistance was not studied through a sufficient range to allow of definite conclusions being formulated. M. L. Le Chatelier, the able Secretary of the Commission, concludes, however, that so far as the experiments go they show a constant resistance for all speeds up to 19 miles an hour in curves of 656 ft. radius and up to 25 miles an hour in curves of 320 ft. radius. Above these limits the resistance increases proportionately to the speed. These remarks apply only to cases in which there is no superelevation.

One of the most important points to be settled by an investigation of this character is to what extent sharpness of curvature should be compensated for by decrease of grade in locating new lines. Owing to the great variations which atmospheric conditions make in the resistance of a curve, this point cannot be easily settled, but it may be noted that a slippery state of the rails, which lessens the adhesion of the locomotive, also reduces the resistance on the curve, and consequently a curve that is properly compensated for fair weather, as compared with the tangent, will be over-compensated when the rails are greasy. As a fair practical estimate, however, M. Le Chatelier concludes that the extra resistance on a curve of 656 ft. radius is equal to slope of 0.4 per cent., and on one of 492 ft. radius to a slope of 0.6 per cent. These figures are materially higher than the actual experimental resistance found would appear to warrant, and thus include a factor of safety.

The commission have also made experiments on a curve of 245 ft. radius, and the general results obtained have been summed up by M. Le Chatelier as follows: (1) Every type of engine, carriage, and wagon used in the every day working of French railway lines can pass freely over a curve of 358 ft. radius, or even of 245 ft. radius of standard gauge line without requiring any widening of the track. (2) Such widening is of no advantage, and may cause instability and increase of resistance. (3) The use of a tangent between reverse curves is useful only in point of view of action of the buffers, and need not exceed 33 ft. to 66 ft. in length. (4) Superelevation can be entirely omitted without compromising the safety of the train even at comparatively high speeds. Excessive superelevation may become a cause of instability by favoring the displacement of the axles toward the inner rail. (5) The resistance of all kinds of vehicles, as well as of locomotives of different types in curves of 328 ft. radius, is on an average about 18 lbs. a ton. This figure may be reduced to 11 lbs. or 14 lbs. a ton without the use of complicated devices. In curves of 245 ft. radius the average resistance does not exceed 22½ lbs. per ton.

The question of transition curves has also been discussed in the *Bulletin*, and the experiments at Noisy-le-Sec have a bearing more or less direct on this subject, but we must reserve this important subject for a future article.—*Engineering.*

A Launch at Sparrow's Point.

Last Saturday at 2:30 o'clock p. m., the steamer "Alabama" was launched at the yards of the Maryland Steel Co. at Sparrow's Point. A large party of guests of the company went from New York on a special train furnished by the courtesy of the Baltimore & Ohio Railroad. The train consisted of a combination car, a dining car and two parlor cars of the Royal Blue Line, to which was attached also the private car of Vice-President Lord. The party left New York at 8:30 in the morning and reached New York on its return at 10 o'clock in the evening, having been brought back by the same train. To many of the party the journey down and back was as interesting as any part of the day, for the weather was beautiful, the train comfortable, and the company good. The train, which ran both ways as a special, made the round trip without a detention and without a stop except at Philadelphia. Those who are familiar with the progress made by the Baltimore & Ohio Railroad in the last four or five years were not surprised at this example of high class railroading, but there were a good many members of the party to whom it was a very suggestive object lesson. The speed of the train was high throughout the journey. One mile which was carefully timed was made in 53 seconds and five consecutive miles were made at an average of 58.4 seconds. These speeds were taken incidentally, and may have been or may not have been the fastest miles run.

A special train brought over a party composed of Admiral Folger and other naval officers and their friends from Washington, and boats brought other people from Baltimore, so that a large number were present. The launch went off perfectly as announced, and after it was over many of the invited guests went through the ship building plant and the rail mill.

The "Alabama" is building for the Baltimore Steam Packet Co., and will run in the Chesapeake Bay trade. Her displacement is 2,200 tons; length over all, 305 ft.; length between perpendiculars, 290 ft.; molded breadth, 43 ft.; breadth over guards, 55 ft.; molded depth, 18 ft. The hull is built throughout of steel, with heavy scantlings. The keel is of the centre, through-plate construction. The engines are 4 cylinder, triple expansion, having two lower pressure cylinders. The cylinders are 24½ and 40 and 47 in. diameter by 42 in. stroke. The reciprocating parts have been kept as light as possible, steel pistons being employed, and the cranks are so placed that two pistons of approximate weights shall always be opposite. There is an independent condenser with centrifugal circulating pump. The propeller is 12 ft. 9 in. diameter with cast steel blades. The boilers are designed for 160 lbs. pressure; they are 12 ft. in diameter and 10 ft. 3 in. long inside. It is proposed to fit up the passenger quarters very handsomely. An electric lighting installation, furnished by the Edison General Electric Co., provides for 360 incandescent lamps and a search light of 6,000 c. p. The same plant also runs two 32-in. exhaust fans for ventilating the dining saloon.

Alongside of the "Alabama's" berth a new steamer is building for the Merchants' & Miners' Transportation Co. to run on the Baltimore & Boston route. The vessel is 293 ft. long over all, 42 ft. molded beam and 33 ft. 2 in. molded depth. This also will be a steel ship throughout. She will have triple expansion engines 28 in., 45 in. and 72 in. diameter by 48 in. stroke, with Williamson's steam steering gear, Williamson's hoisters, steam windlasses, etc.

The shipbuilding plant of the Maryland Steel Co. was begun a little more than two years ago, and prominent steamship men as well as leading shipbuilders who inspected the plant expressed the opinion that these yards are destined to become among the greatest in this country, if not in the world, for the reason (among others) that all the steel which goes into a ship is manufactured, or soon will be, from the ore, at the works. In this way delays in procuring the necessary materials from different and distant mills and shops will be avoided, which advantages are probably not shared by any other ship yards in the world, with possibly one or two exceptions.

The Maryland Steel Company, as is well-known to our readers, is essentially the same as the Pennsylvania Steel Company in ownership and in administration. The company secured about five years ago a thousand acres of land on the north shore of the Patapsco about six miles below Baltimore. Here it erected blast furnaces, a Bessemer plant and rail mill with an iron foundry, pattern shop, machine shop and boiler shop. These latter are adapted for general engineering work, but will probably be largely employed on the work of the marine department. The employés of the two companies (the Maryland and the Pennsylvania), including those working in their mines, number over 7,500, and from 10 to 12 steamships are engaged in carrying the necessary ores from Cuba and Spain. The use of Cuban and Spanish ores, and the carrying of a large stock of ore insure low phosphorus, and high grade and uniform quality of steel.

The marine department itself has been organized, and built up under its present Superintendent, Mr. Frank B. King, and it includes the necessary shops, tools and power for an important ship building business. Four building slips are now completed, ranging from 300 to 360 ft. in length. The tool shed is 140 × 435 ft., and contains punches, shears, furnaces and bending rolls. On one side of the building is storage for material which will be commanded by an electric traveling crane for unloading and stocking the plates and shapes. The machinery in this department is run by a Westinghouse compound engine, and, in fact, the shops throughout the marine department are equipped with the same engines all of the same size; that is, with 8 in. and 13 in. × 8 in. cylinders. The plate and angle furnaces are heated by oil, and are double ended so that the work may be drawn from either end. In this shop may be seen a hydraulic garboard machine by Bement, Miles & Co.; a hydraulic manhole punch by Todd, of Youngstown, with a capacity to punch holes 30 × 21 in. through ¾ in. plates; a double beam punch by Long & Allstatter, also a shaper, punches and shears for plate work from Bement, Miles & Co., two large duplex plate planers from Hilles & Jones and other tools,

In the building slips will be noticed a novelty in the way of a compressed air service. Down the length of each slip is a 2-in. pipe, and above ground are plugs, at short intervals, from which air can be taken for the riveting, drilling and calking tools. The rivet heating furnaces also get their blast from the same source.

The blacksmith shop is 70 x 225 ft. and arranged for 45 fires. There are now in operation three steam hammers of 300, 1,200 and 1,500 lbs. respectively. A 4-ton steam hammer is ready for erection. The boiler house is 40 x 106 ft. In this are the Babcock & Wilcox boilers for general steam purposes, and the electric plant for lighting the yard and shops will be installed here. The joiner shop and carpenter shop is of two stories, 60 × 270 ft. The machinery in this shop is driven also by Westinghouse compound engines of the size mentioned above.

The fitting out pier is 163 × 425 ft. In this is the fitting out shop intended for the erecting engines and the miscellaneous machine work necessary for the complete fitting out of the vessels built. This shop is 120 × 210 ft. A 20-ton electric crane is now being established to command the erecting shop, and a larger one will soon be put in. This shop is so situated that the hulls can lie close alongside on three sides, and near by, at the end of the pier, are the shears, which have a capacity of 125 gross tons. These were built and designed by the marine department of the works. Their dimensions are as follows: Length of front legs, 120 ft.; diameter of front legs, 30 in. in the middle; length of back leg, 133 ft.; spread of front legs, 45 ft.; diameter of sheaves in main blocks, 6 ft. The foot of the back leg travels on a curved guide downward and backward or upward and forward. By this motion the head of the shears can be drawn back to 10 ft. inside the heels of the front legs, and it can be run out to overhang 50 ft., or 43 ft. beyond the outer line of the wharf. The total travel of the head is therefore 60 ft. in and out. The front legs are set in steel castings with ball and socket joints. All the motions of these shears will be controlled by hydraulic power.

To the railroad man, the rail mill must be the most interesting part of this great plant, and it is said by those most competent to judge that it is the best rail mill in the United States, which means the best in the world. Its full capacity has never been reached, but Major Bent thinks that an output of 2,000 tons a day can be sustained. Our readers probably know already in a general way the chief innovations in this mill, the most important and interesting of which is the method of casting, although, from the blast furnaces and stock houses to the loading of the rails, everything has been planned and constructed with the light of the most modern knowledge and with the purpose of economizing manual labor. A description of this plant we must, however, leave for a later issue.

One striking fact at Sparrow's Point, as at others of the great steel works of the United States, is the preponderance of young men in the highest grades; and this we take it is partly and even largely due to the technical schools which are now supplying large numbers of men so equipped that if they have the talent* they can rise fast.

Wire Rope Transportation and Transmission.*

The rope tramways have long been recognized as a means of cheap transportation. Their advantages as feeders to established systems of railroad or water communication and their low cost of construction through countries where, from the rugged contour of the surface, ordinary railroad, or even wagon-road building would be scarcely practicable, have always made them very attractive to the mines and quarrymen, to whose use in this country they have been heretofore almost exclusively confined. The earliest tramways of this kind which were successfully introduced consisted of a single, moving, endless rope, from which loads were suspended. The original Hodgson tramway, and its modification by Hallidie, are the ones chiefly used in this country.

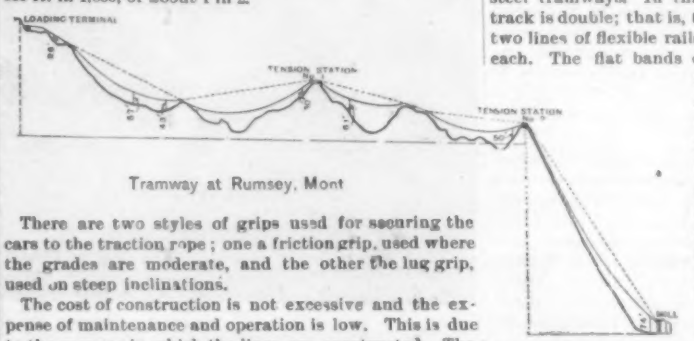
In the former the buckets or carriers are attached to saddles which ride on the rope, but can be separated from it. In Hallidie's modification, the carriers are attached permanently to the rope. But in each of these systems one and the same rope both supports and moves the load. While these lines are very efficient for certain purposes, they are not available for general use as a means of transportation, because of their limited capacity for carrying individual loads, which in no case can exceed 300 lbs., and in practice are generally much smaller. It is for this reason that aerial transportation has, until within the past few years, found so limited an application in the United States, but since the introduction of the Bleichert system its scope has been greatly widened.

This system uses separate stationary cables, on which run the carriages supporting the cars, the motive power being transmitted through a light, endless, moving rope, to which the cars are attached by grips. The advantages of the "double-rope" lines have been so well appreciated in Europe and other countries that they have almost entirely supplanted the "single-rope" system as a general means of transportation. This system is adapted to the heaviest kind of traffic, for while the individual loads of the Hodgson or Hallidie lines should not exceed 150 lbs., the lines of the Bleichert system are adaptable to individual loads up to 1,000 lbs. each.

All single-rope tramways, where the moving rope carries the load, must necessarily move slowly, otherwise there is great danger of the rope jumping out of the carrying sheaves. In the Bleichert system this trouble never occurs, since the stationary carrying cables have no tendency to leave the saddles in which they are supported. This being the case, there is no difficulty in moving the cars of these lines at a speed of three or four miles an hour.

In the Hodgson type, no inclination of the rope steeper than 1 in 3¼ is permissable; in fact, 1 in 4 is really about the limit. On steeper inclinations there is great danger of the saddles or box heads slipping with the loads. This danger is obviated in the Hallidie type of tramway by the use of steel clips, which fasten the buckets permanently to the rope. While this corrects the danger of slipping, it occasions the further objection that the buckets must be both loaded and unloaded while moving.

In the Bleichert system the inclination of the carrying cables need not necessarily follow the contour of the ground. In crossing valleys and streams, for instance, long spans are permissible. These points are well illustrated in the profile of the lines built for the Granite Mountain Mining Co. at Rumsey, Mont. This line is 8,750 ft. in length, has a fall of 1,297 ft., and develops over 14 H. P. On this line there is one span of 600 ft., and from "Fred Burr Hill" down to the mill, at Ramsey, the grade is unusually steep, there being a fall of 850 ft. in 1,800, or about 1 in 2.



Tramway at Rumsey, Mont

There are two styles of grips used for securing the cars to the traction rope; one a friction grip, used where the grades are moderate, and the other the lug grip, used on steep inclinations.

The cost of construction is not excessive and the expense of maintenance and operation is low. This is due to the manner in which the lines are constructed. The carrying cables, being stationary, can be locally graduated to the strains they have to bear. The cable for empty cars does not, of course, require to be as strong as the cable for loaded cars, and it is therefore made only strong enough for the work that it has to perform. In like manner, if one or more long spans occur in the line, it is not necessary that the whole cable should be made strong enough to bear the extra strain at this one point. On very long, steep grades, also, where the cable at the head of the incline must be able to bear, not only the ordinary working strain due to the cars, but must also sustain the whole weight of the cable on the incline, this is effected by making the cable in sections of gradually diminishing area. In this way great economy in the actual weight of the cable is effected.

Where power is required the demands of the Bleichert system are less than with the single rope construction, because the traction rope, instead of being loaded down by the cars, is itself carried and supported by them, which also lessens greatly the wear on this rope. This system will also work by gravity on light inclinations. For example, the line built for the Old Dominion Copper Co., of Globe, Arizona, has a fall of only 100 ft., in a total length of 1,250 ft., and yet this line runs by gravity on a daily output of 100 tons.

The spacing of the supports depends altogether on the contour of the ground. Where this is level the average spans recommended are from 150 to 200 ft., but where the country is rugged, and contour of the line much broken, as exemplified in the profile of the Granite Mountain tramway, the distances between the supports vary greatly. The greatest strain upon the carrying cables occurs at the crests of the ridges, and the supports here must be correspondingly close together. Where the ridge is a very sharp one, "rail stations" are used. These consist of a series of bents from 15 to 20 ft. apart, supporting fixed rails on which the cars travel, the cables being deflected to one side. In this way undue wear on the cables, which would occur at these points, is avoided. In crossing ravines, valleys and rivers, on the other hand, spans are frequently made up to 1,000 ft. Many lines built within the past few years have clear spans up to 1,500 ft.

In some cases, where the spans are moderate and the loads to be carried are light, steel rods may be substituted for the carrying cables. These rods are furnished in lengths of 50 ft., and are joined by a special coupling. The cost on this account does not differ materially from that of a line equipped with the regular cables, but the rods are practically indestructible and never require any renewing.

For short lines, where the service is light, a single line of carrying cable may be used. In such cases convenient turnouts are arranged along the line, and the trains of cars are spaced equally along the endless traction rope in such a manner that they pass one another at the turnouts. The only advantage possessed by such lines is cheapness; the cost of operation is the same as the double track.

If required, the cars may be weighed and counted automatically, and can also be raised or lowered at any terminal or station from one level to another without the necessity of handling. Thus, goods can be brought in at one level of a warehouse, raised or lowered to any other floor, and upon arriving at that floor can be conveyed to any point desired before unloading.

Among the lines in operation is that of the Bi-Metallic Mining Co., at Granite, Mont. The total length is 9,750 ft., with a fall of 1,225 ft. The descending loads, amounting to a constant weight of about 11 tons, develop over 14 H. P., which is sufficient to haul the empty buckets as well as about 30 tons of supplies per day up the line, and also run the ore crusher and elevator. At the present speed of the line, it is capable of delivering 200 tons of ore every 10 hours; but, by a slight increase of speed, its capacity can easily be increased to 250 tons without necessitating any material addition to the force of men employed. Under the latter conditions, the cost of transportation would be about 10 cents per ton, or five cents per ton per mile. Another line at Aspen, Colo., with a daily capacity of 250 tons, has a fall of 2,409 ft. in a total length of 9,850 ft. and develops about 60 H. P. The steepest tramway in the country is one built for the "Holy Moses" Mining Co., of Creede, Colo. It has a fall of 1,020 ft. in 2,000 ft. and leads out from the loading terminal at the mine on an inclination of 31 degrees, or a fall of 60 ft. in 100. The daily capacity is 250 tons.

Closely allied to the wire rope tramways are the Acme steel tramways. In this construction the supporting track is double; that is, the cars are suspended between two lines of flexible rails by four wheels at the top of each. The flat bands composing the rails are easily coupled and give a uniform smooth surface for the car wheels. The flat steel track bands can be rolled in lengths up to 300 ft. and coiled for shipment. This double construction of the track permits the use of supports of the simplest design, as the pressure is all directly downward and no overhang has to be provided for.

In lines where the traffic is very great and the surface practicable for the most part for surface tracks, but rugged in places, with ravines and rivers to be crossed, a rope haulage may be introduced advantageously by using a combination of surface tracks and Acme tramway, the latter being applied to the bridging of the valleys, streams and other points where it would be impracticable to lay surface tracks.

The single-rope Hodgson and Hallidie systems have been alluded to. The speed of the rope in lines of the Hodgson type is about 2½ miles per hour. The necessary working tension is produced by passing the rope around a tightening sheave, usually mounted upon a carriage that travels on an inclined track at one of the terminals, the grooves of all the sheaves being packed with a suitable filling. In the Hallidie system the speed is practically limited to about 180 ft. per minute.

Cases frequently occur where special forms of wire rope tramways may be used to advantage. Lines are sometimes constructed with fixed cables serving as tracks, for the cars in which the traction rope is given a reciprocating motion instead of running continuously in one direction as in the preceding systems. There is a line of this character at Aalsund, Norway, consisting of two steel ropes 1⅛ in. in diameter, anchored at the mines, which are at the summit of a steep cliff, and counterweighted to the proper tension at the bottom. The line makes a clear span of 2,250 ft. and terminates on a pier at the foot of the mountain. One car travels upon each rope, carrying a bucket of 12 cwt. capacity, and the loaded car in descending hauls up the empty car.

The traction rope passes around suitable brake sheaves at the mine, by means of which the descending load is governed. The incline is at an angle of 45 deg. and the speed at which the cars run is from 15 to 20 miles per hour.

Cable hoists and conveyors are also especially adapted for quarry purposes where heavy individual loads are to be handled, as they can be efficiently operated in clear spans up to 1,500 ft., and in lifting loads up to 15 tons. A general arrangement of endless rope cable hoists consists of a main cable passing over towers, A, frames or masts, and anchored firmly to the ground at each end, the requisite tension in the cable being maintained by a turnbuckle at one anchorage. The carriage travels upon this cable. The hoisting is done by a separate rope. This rope is reeved about the lower sheaves of the carriage and the fall block from which the load depends; the number of sheaves corresponding to the number of "parts" in the rope. In order to obviate the accumulation to too great sag in the hoisting rope when the carriage is run far out from the starting tower, the rope is supported on what are known as "fall rope carriers," the number of which depends on the length of the span, and the arrangement being such that they are dropped along the line at regular intervals as the carriage runs out, and are gathered up again in bringing the carriage back.

*Compiled from a pamphlet issued by the Trenton Iron Co., Trenton, N. J.

Two styles of these carriers are used. In the Locke arrangement the carrier consists simply of a couple of iron straps, between which are two small rollers, the upper for traversing the carrying cable and the lower for supporting the hoisting rope. The carriers are attached to a series of light chains, the length of which determines the spacing of the carriers along the line. With the Miller carrier the spacing is effected by means of a light rope stretched just above the main cable, attached to which, at regular intervals, are oval-shaped buttons of varying size and corresponding in number to the number of fall-rope carriers. Starting with the carriage at the support where the line is driven, the carriers all rest on a pointed arm or "horn" projecting from the rear of the carriage just above the main cable, with the button rope passing between the straps comprising the sides of the carriers. As the carriage moves out it encounters the first button, which is of such size that it passes through all carriers but the last, which drops off on to the main cable; the next button causes the next carrier to drop off, and so on. In returning, the horn of the carriage picks the carriers up again.

Wire rope will always be an important factor in mining operations, and its widest application is to be found in its adaptations to the surface and underground haulage of coal and ores as embraced in hoisting, inclined planes and haulage. On inclined planes no rule can be given for determining the least angle of inclination that can be worked by gravity. For planes up to 500 ft. in length, the minimum grade may be assumed at about 5 per cent. For longer planes, from 500 up to 2,000 ft., it varies from 5 to 10 per cent., being greater in proportion to the length of the line and less in proportion to the load. The profile of the plane should be concave if possible, with the steepest inclination at the top. Where grades are so slight that gravity cannot be utilized as a motive power, a continuous system of wire rope haulage is commonly applied either by a "tail rope," or an "endless rope."

Curves may be made of very small radii, but where the radius is less than 60 ft. the trips should be taken around the curve at a moderate speed. The ordinary speed at which the ropes may be run varies from 8 to 12 miles an hour. As a sample of inclined plane work, take the Mahanoy incline of the Philadelphia & Reading R. R., which is 2,486 ft. long, with a vertical elevation of 353 ft. and a maximum capacity of 1,000 cars in 24 hours, or about 25,000 tons. The rope used is 2½ in. in diameter, but it is proposed to replace this with a 2⅝-in. rope.

The ordinary ropes used for haulage purposes consist of six strands wrapped about a hemp core, each strand being composed either of 7 or 19 wires. The ropes of smaller wires are the more flexible, and therefore, as a rule, better adapted to sharp bends; on the other hand, they are not as well adapted to withstand surface wear as ropes of 7 wires to the strand. Wire ropes are made with a short twist or a long twist, according to local requirements. The former is more elastic, and on that account is preferred for shafts and inclined planes, where the strains are suddenly applied; while the latter are preferred on long haulage lines, on account of the lesser stretch. For surface wear, however, the "locked wire" rope, which is as smooth as a turned bar of metal, is probably the best.

The first application of wire rope for the transmission of power was made by the Hein Bros., of Mulhausen, Switzerland, in 1850. For this purpose, the rope best suited to the work is composed of six strands of seven iron wires each, laid together about a hempen centre. The driving wheels are usually of cast iron, and are made as light as possible consistent with the requisite strength. Various materials have been used for the filling, such as tarred oakum, jute yarn, hard wood, India rubber and leather. The filling which gives the best satisfaction, however, for transmission purposes, consists of segments of leather and blocks of India rubber soaked in tar and packed alternately in the groove, and then turned out to a true surface. Where the rope is subject to considerable lateral vibration, the flanges are sometimes lined with sole leather by riveting; but such cases are rare.

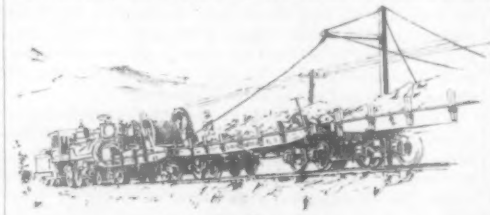
In long spans, intermediate supporting wheels are frequently used, and it is usually sufficient to support only the slack side of the rope, but, whatever the span, the driving side of the rope will require a less number of supports than the slack side. The sheaves supporting the driving side should, in all cases, be of equal diameter in the driving wheels; for it makes no difference whether the rope laps half way around or only a quarter, the tension induced by bending is the same. With the slack side, however, smaller wheels may be used. The actual horse power transmitted approximately equals $3\frac{1}{10}$ times the square of the diameter of the rope in inches, multiplied by the velocity in feet per second.

As for the limits of span it has been found in practice that when the deflection of the rope at rest is less than 3 in. the transmission cannot be effected with satisfaction, and that shafting or belting is to be preferred. This deflection corresponds to a span of about 60 ft. The maximum limit depends somewhat on the contour of the ground and the height of the tower. There is an instance at Lockport, N. Y., of a clear span of about 1,700 ft.

All wire rope tramways are practically transmissions of power of this kind, in which the load, however, instead of being concentrated at one terminal, is distributed uniformly over the entire line, and the actual horse-power transmitted approximately equals 4¾ times the square of the diameter of the rope in inches, less six millionths the entire weight of all the moving parts, multiplied by the speed of the rope in feet per second.

The Lidgerwood "Rapid Unloader."

An efficient device for handling ballast and similar loads, which has recently been brought out by the Lidgerwood Manufacturing Co., is more or less adequately illustrated in the engravings which are given herewith, and which are made from photographs taken on the line of the Delaware & Hudson Canal Co., above Whitehall, N. Y. The unloader, when worked in connection with a steam shovel, covers the process of handling material from the pit to the roadbed. The Barnhardt steam shovel, which is supplied by the same company, will load a train of 17 cars, of about 20 cubic yards each, in an hour and a half. The cars shown as adapted to use with the unloader have sideboards, and steel aprons to connect one car with another, and the brake staff is put on the side of the car. Those shown in the photograph were used by the Drake & Stratton Co., and are 34 ft.



Unwinding the Cable.

long, 9 ft. wide and 60,000 lbs. capacity. The train is pushed past the shovel as each car is loaded, until the load is complete.

The unloading engine is a compound-geared hoisting engine, especially designed for this work. It has double, 10 × 12 cylinders, and can give a direct pull on the cable of 25 tons and draw in the cable at a speed of 125 ft. a minute. The drum is 42 in. in diameter, and is usually grooved for 1¼-in. cable. Steam to run the engine is taken from the locomotive boiler, and in one of the illustrations the fireman is shown turning on the steam. The weight of this machine is 24,500 lbs.

The usual practice is to unwind the cable and make it fast to the plow at the rear end of the train while the train is on the siding, waiting orders. The cable may be unwound by making it fast to a tie, where the end is held while the train is backed. When a sufficient length has been pulled out, the cable is laid over the cars and made fast to the plow. A better method of unwinding is shown in the small sketch, where a simple boom and and mast is erected so as to suspend the cable over the middle of the track; then as the cable is unwound it falls directly on the top of the loaded car.

Another illustration shows the steam connection to the locomotive, called the bag-pipe connection. This also shows the position of the engineman in operating the machine. Unusually large unloading plows may be used. The one shown has a face 48 in. high, the height being increased by a 10 in. plank. The photograph in which this plow is shown was taken at a point where a good view of the train could be had, and not a point where the load would actually be dumped. On a curve such as shown in that illustration snatch blocks would not be used as the cable draws against the load. In winding in a helper is stationed as shown in the illustration to see that the cable is wound evenly on the drum. In another illustration the use of a snatch block to guide the cable is shown. As the plow nears the block the cable is thrown out, and the block dropped over the side of the car, and the plow proceeds until it reaches the next snatch block. Material may be unloaded on a reverse curve by a proper distribution of these blocks.

Unloading, Showing the Plow.

Some of the special advantages of this device, as indicated in letters from those who have used it, are gathered below. One chief engineer says, that a great reason for buying the machine, was that any light locomotive strong enough to pull cars will work the drum, and he could not spare a mogul for this work. Another engineer says that at least 50 per cent. more material can be handled with this device than by the old method; and still another says that he can handle twice as much with it. Another engineer says that by the old method of unloading, a good locomotive weighing 95,700 lbs. in working order, was hardly ever able to draw the plow over the entire train without stopping. When it stopped the locomotive had to be backed up to get headway, giving a terrific jerk on the cable. This resulted in breaks of the cable or of couplings, and locomotive repairs in one month had cost him $500 and averaged about $500. These jerks also sometimes derailed the cars. He had frequently used two locomotives coupled together, and even then was not able to unload by a steady pull. With the rapid unloader such inconveniences have been entirely avoided.

One great advantage of the device is that the speed at which the plow is run can be very quickly lowered where a weak car or a sharp curve requires caution. It is customary to have a man with the plow who signals to the engineman when it is desirable to reduce or increase the speed. In unloading, the locomotive can draw the train in the same direction that the plow is running, and by running the locomotive at a constant speed, and varying the speed of the plow, the delivery of ballast along the track may be regulated to a nicety; or the train may be pushed in the direction opposite to that in which the plow is moving, and a great amount of material delivered in one place. For instance, in filling a washout or unloading at one point, the plow may be drawn in one direction and the train moved in the opposite direction, both at the same speed.

It is said that the entire operation of stringing the cable, making fast to the plow, running a mile, unloading and returning to the starting point, has been performed in about 20 minutes by actual timing on the Delaware & Hudson. The following letter from Mr. A.

Operating on a Curve.

J. Swift, Chief Engineer of the Delaware & Hudson Canal Company, sums up his observations of this machine so excellently that we publish it in full:

1st. So far as I am familiar with such work, the methods have been: By hand labor with shovels; by dump cars with bottoms built at an angle and with movable sides or with bottoms tilting to an angle; by "ballast unloaders" or plows, drawn by detached locomotives over all the cars in the train.

2d. In my opinion the new method, first used upon this company's roads in 1890-91, is superior to all other methods, the following being points of superiority:

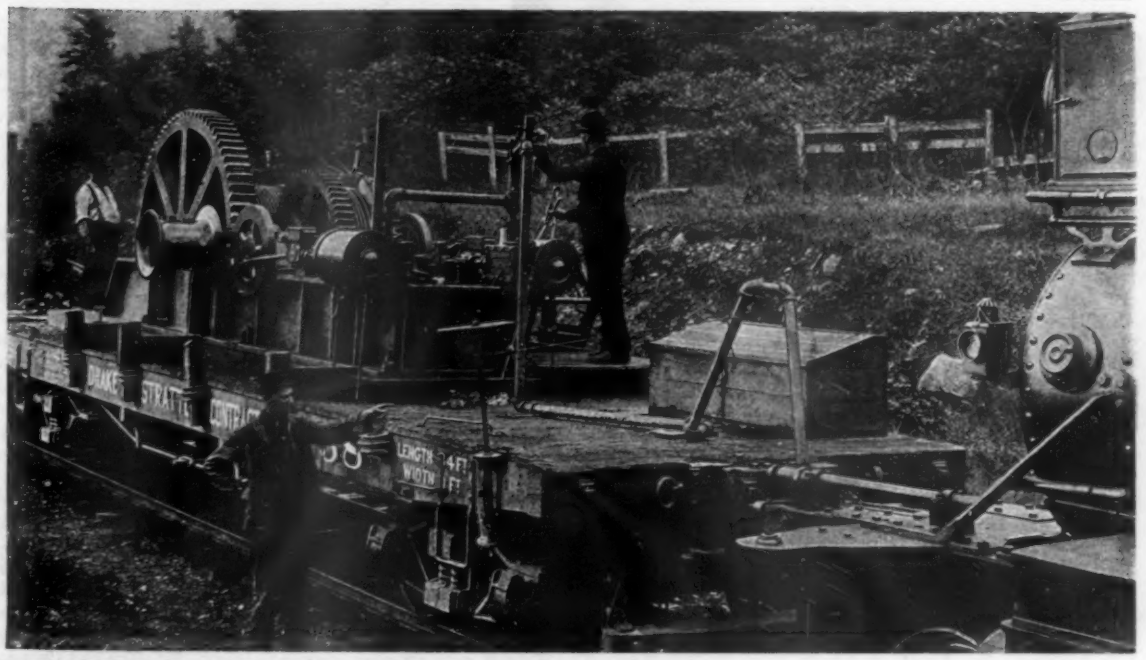
1. Much less time is required to unload a train.

2. The most unmanageable material is readily unloaded, such as frozen masses of clay, etc., thus rendering it possible to continue work which would, under methods formerly used, be necessarily abandoned. This advantage results from the fact that all strain is taken up by car platforms between stationary engine and plow, and all increase of work thrown upon this engine; while, with a detached locomotive, power could only be increased by using two locomotives, which frequently required anchoring the train by chaining to track, resulting in injury to the latter.

3. All material on a train can be deposited at one spot by backing the train as fast as the plow is pulled ahead, or, by regulating the speed and moving the train in the same direction as the plow, any desired amount of material can be deposited per lineal foot of the track.

4. Owing to the shorter time required to unload a train by this method better facilities can be given by dispatchers.

3d. In my opinion, assuming that the supply of material on cars is sufficient, at least four times the amount can be unloaded in a day by this method that can be handled by others, this advantage resulting from the facts noted above as to less time required to unload and better chances for unloading. This estimate is based upon the supposition that the work is to be done on a busy, single track road.



The Rapid Unloader, Showing Steam Connection.

The Screw Ferry Boat.*

As early as 1805, a screw steamboat, constructed by John Stevens, made a run as a ferry-boat between Hoboken and the city of New York. This boat was about 24 ft. in length, built upon the Whitehall pattern, and was propelled by twin-screws at the stern. The engines of the boat are now in the Stevens Institute of Technology at Hoboken.

The steam ferry-boat from its introduction in 1812 has always been of the sidewheel type, although as early as about 1850 the construction of a screw boat for ferry service was contemplated, and indeed plans for such a vessel prepared. In 1867 the subject was again agitated, but the project abandoned under the belief entertained that such a mode of propulsion was impracticable, chiefly because of the fear that no screw could be made to stand against the ice that packed in the ferry slips.

The gradual increase in traffic between the cities in port produced a problem as to how best to meet the subject and provide adequate facilities. No more landing places in the city of New York could be obtained than were already held by the various companies, and without additional landings a greater number of boats could not be run with any advantage to the public; larger carrying capacity must therefore be provided.

In 1887, with this problem before them, the Hoboken Ferry Company commenced the design for a screw ferry-boat. Without any previous experience upon which to build, nor yet any vessel of approximate character to consult, the Bergen was designed, built, and in March, 1889, was placed on duty where she has since performed a most satisfactory service both as to speed, economy, facility of handling and increased capacity, which is 29.8 per cent. more than a side-wheel ferry-boat of equal length and breadth. The following table will compare the Bergen with one of the sidewheel boats of the Hoboken ferries:

Hull.	Bergen, Steel.	Moonachie. Wood.
Length, L. W. L., ft.	200	200
Beam " "	32.16	32
" over guards	62	62
Draught to base line.	8.83	7.5
Space available for passengers	4,330 sq. ft.	3,335 sq. ft.
Space available for teams	3,443 "	3,380 "
Number of seats for passengers	296	236
Engine—type	T. ex. propeller	Low press. beam.
size	18½ in. x 27 in. and 42 in. x 24 in.	44 in. x 10 in.
Steam pressure	160 lbs.	30 lbs.
Average H. P. in regular service	695	450 estimated
Speed, measured mile	14.6	
Average speed in regular service	13	11 estimated

By comparison with the largest sidewheel boat in the service, the Bergen will consume nine per cent. less coal to produce the same results. The performance of the screw ferry boat in ice is such as to place it far in advance of any other type of boat required to make a head-on landing. The screws (submerged two feet below the surface of the water) have never suffered breakage by contact with ice, nor has the speed been materially affected in passing through large fields.

The hardest ice service, however, is that which is packed in the slip and held fast by the bridge pontoon in front and the racks on either side. While under these conditions there are times when the sidewheel boat cannot force her way to the bridge, but the screw-boat makes her way without difficulty, the forward screw clearing the pathway for the entrance of the hull, and at no time, even under the worst conditions, has the use of a gang plank been necessary for the landing of passengers or teams.

The peculiar model in which are employed a full flaring upper body, a very fine under-water body, with a full water line and a sharp V-shaped midship section, and the peculiar cutting away of the ends to bring the rudder and screws within the perpendicular of the stems, is responsible for the stability of the vessel, and the ease of entrance and clearance, and of her valuable ice qualities.

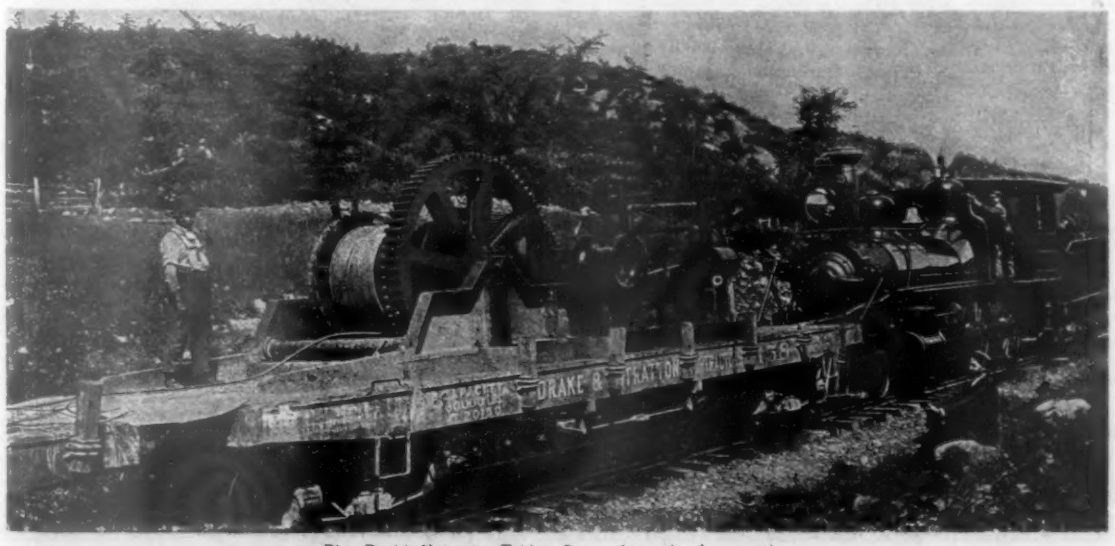
The fact of the screws being upon one shaft, and the forward one pulling when under headway and meeting a most solid resistance when reversed, renders the stopping qualities exceptionally good, and experience has demonstrated that the screw boat can kill her headway and come to a dead stop in about half the resistance required by a sidewheel boat. The steering qualities are all that can be desired, the helm being answered very quickly and with great steadiness.

Following the "Bergen," and after she had proved her value by actual service, the N. Y. L. E. & W. R. R Co. constructed the "John G. McCullagh," following the same general principles, though differing in detail. After this the P. R. R. Co. produced the "Cincinnati," and about the same time the "Bremen" and "Hamburg" were commenced by the Hoboken Ferry Company. All of these are now in successful operation.

The writer has the honor of having been intimately associated with the designing and construction of the "Bergen," "Bremen" and "Hamburg," as well as now having charge of their operation, and while making no attempt at a scientific consideration of the subject, has endeavored to submit something of the history of the screw ferry-boat and the results thus far attained.

It has not been found that the screw-boat is more economical than the beam engine boat as to fuel, manning or repairs, but its commercial value in carrying capacity, facility of loading and unloading, and ease of motion, added to the perfection of handling to which I have alluded, renders the type one which must inevitably be adopted by all ferry corporations who have to face the constantly increasing tide of travel to and from the great metropolis.

* By E. W. Woolsey, Superintendent Hoboken Ferry Company.—From the Proceedings of the U. S. Naval Institute.



The Rapid Unloader Taking Steam from the Locomotive.

Railroad Legislation During the Past Year.

The following is a summary, made by *Bradstreet's*, of that portion of the address of Hon. John F. Dillon, before the Bar Association at Saratoga, which refers to railroad legislation. The address is a summary of the principal laws passed by the National and State legislatures during the past twelve months, and is the only brief summary of the kind that is published. Some of the statements in the edited summary that we quote are lacking in precision, but they give, in general, a correct idea of the facts:

A number of laws affecting railroad corporations were passed during the year covered by the report. Among these may be mentioned the laws of New York revising and consolidating railroad laws; the laws of Georgia amending the railroad commission law by extending its powers of prosecuting violations of the rules and regulations of the commission, by authorizing the commission to investigate facts affecting through rates and to report them to the Interstate Commerce Commission at Washington, and enlarging the field of supervision of the commission so as to include express and telegraph companies; regulating railroads as to the sale of tickets on connecting roads; providing equal accomodations and separate cars for white and colored passengers; making railroads subject to municipal taxation, and enacting a general law for the incorporation of railroads; the laws of Massachusetts authorizing railroads now operated by steam power to use electricity as a motive power; requiring them to maintain crossings which give access to lands cut off by their tracks; directing them to provide interchangeable mileage tickets; abolishing grade crossings at particular places; and forbidding, as does South Carolina, railroads to issue to any state officer free passes or any ticket at less than the ordinary price; the laws of Ohio allowing railroads to borrow money upon mortgage in cases where heretofore they have been authorized to issue preferred stock; allowing stockholders in Ohio railroads who refuse to assent to their consolidation with other roads to receive the highest market value for their stock, which may be ascertained by arbitration; prescribing penalties for overcharging for transportation of freight or passengers, for switching and for transporting cars of other companies, and requiring connecting railroads to transport each other's cars, and prescribing rates for switching; the laws of Iowa making the schedule of joint rates prima facie evidence that the rates therein fixed are reasonable and just maximum rates, and requiring common carriers to furnish additional reports when required by the commission; and the law of Virginia regulating transportation by common carriers, and containing the usual provisions as to the long and short haul, rebates, drawbacks, etc.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

A correspondent sends us a sketch of a 34-ft. car showing a suggested change in spacing the trucks. The proposed spacing is 8 ft. 6 in. from end of car to king bolt and 8 ft. 6 in. from king bolt to centre, dividing the car into four equal parts. He asks: "(1) Were there ever any reasons for locating the trucks of freight cars so near the ends and so far from the centres as they are now placed? (2) Can you state any objection to changing the truck from its present position so as to place the bearing equally distant from the end and centre of the car?" We suppose that there are at least two reasons for locating the trucks of freight cars near the ends: (1) The increased regularity of the lateral motion of the ends of the car. (2) The decreased lateral displacement of the car couplings. This is the result of the decrease in the over-hang of the ends of the cars. The Master Car Builders' vertical-plane coupler is not adapted for much lateral displacement of the ends of cars, and the nearer the trucks are to the ends of the car the nearer the coupling will be to the centre of the track on curves. The difficulty of coupling arises not so much when cars are all of the same length and all have the same distance from the ends to the centre of the truck, but when cars of different lengths, with different distances from the ends to the centre of the trucks, are brought together on a curve. This was well explained in the *Railroad Gazette*, Oct. 3, 1890, and is a very important matter, as there are certain classes of cars now running on which it is impossible to use the vertical plane coupler owing to the great difference there would be between the lateral displacement of couplers on those cars and that on the ordinary cars. This more particularly refers to the short coal dumps such as are used on the Pennsylvania, the Baltimore & Ohio, and other roads. When there is much overhang on a car the ends move irregularly. This is particularly the case with street cars, as one will notice when riding on the front or back platform of cars having short wheel bases. It is probable that the car shown by the sketch sent by our correspondent would couple well except on comparatively sharp curves; but such an arrangement would have no advantage from a mechanical standpoint, and would make difficulty in coupling in crooked yards, and would certainly be unsteady laterally when running on to sidings or when passing from a tangent to a curve or from a curve to a tangent. Again, such an arrangement of trucks would not give as steady motion to a car when running especially if the trucks were provided with a swing motion.

The Six Old Chicago Railroads.

I.

Among the most prosperous railroads in this country have been the lines which extend westward, southwestward and northwestward from Chicago. Until comparatively a short time ago there were but six such companies, which, beginning on the north, are the Chicago, Milwaukee & St. Paul; the Chicago & Northwestern; the Chicago, Burlington & Quincy; the Chicago, Rock Island & Pacific; the Chicago & Alton, and the Illinois Central. Down to the time the Wabash built its Chicago outlet, about 1880, these companies carried nearly all the traffic between Chicago and the fertile agricultural country west of Lake Michigan and Indiana, which for years had been growing in population and production faster probably than any other country ever grew, and which has continued to grow rapidly since, though that part of it east of the Missouri and the Dakotas, being by that time pretty well occupied, has grown less rapidly since than before 1882. The territory had not grown equally, however: the northwestern part was much less developed than the territory directly west and southwest of Chicago, through which railroads already extended as far as the Pacific coast, and in which Kansas and Nebraska and Colorado afforded important traffic before the Dakotas had fairly begun to grow, and when even Northern Minnesota was sparsely settled.

Meanwhile the situation at Chicago has changed greatly. Instead of two lines between Chicago and St. Paul there are now six, there is one more line to Omaha, and four more to Kansas City. Part of these new lines have been opened by the six old companies, but there has been an important addition to the number of companies whose lines enter Chicago from the West. The Wabash, with a vast mileage in the southwest already completed, was first to secure an independent Chicago outlet. What is now the Chicago Great Western, with lines to St. Paul and Kansas City, is an entirely new line. The Wisconsin Central, becoming the outlet of the Northern Pacific, has found its way into the city and, most important of all, the Atchison, Topeka & Santa Fe, which had an enormous system west of the Missouri, built a new line from Kansas City to Chicago. Early, by a circuitous route, the Rock Island had reached up to St. Paul, far north of its old territory; much later the Chicago, Burlington & Quincy secured a reasonably direct line to that city. The Milwaukee & St. Paul meanwhile extended its system far to the south, and made a line first to Omaha and then to Kansas City. Meanwhile other lines and branches of the several companies were extended in the West across each other's systems in such a way as to greatly multiply the number of competing points; and about 1886 and 1887 there seemed to be a race between many of the Chicago companies and others south of them in building lines in the hitherto little occupied districts of the Dakotas, western Nebraska and Kansas and adjacent territory east of the mountains.

All the six old Chicago railroads, with one exception, have greatly increased their mileage within the last ten years, and of course their capital. They have gained the traffic of new districts and have lost by the competition which they have caused each other and which is due to other new railroads, not all of which are Chicago lines. There are of course many other circumstances which have affected their traffic and their rates, among which are the growth, as rapid probably as could have been expected, of the trans-Missouri country, and especially of the mountain country, and local and national legislation.

The reports of the six old companies have now all been made for the last fiscal year, two of them being for the calendar year 1891, one for the year ending with March, one for that ending with May, and two for the year ending with June, 1892. It should be noted beforehand that the year ending with January last was decidedly less favorable for income than those ending with later months, because the harvest of 1890 was very bad and that of 1891 exceptionally good, and therefore the Chicago, Burlington & Quincy and the Chicago & Alton, showing the effect of the better situation for only about four months of the year for which they report, and the other companies for six, eight and nine months, the former are relatively at a disadvantage.

Before discussing the changes in each of the several companies, we will give the data for the six taken together, comparing the tables of the last fiscal year with those for 1882, or the fiscal year ending in 1882, with the exception that the Illinois Central figures of 1883 are given because it then first worked its Southern system, which makes it very different from what it was before. With this explanation we give the following comparison:

Six Chicago Railroads.

	1891-92.	1882.	Inc. or Dec.	P.c.
Miles worked	22,460	14,170 +	7,290	48.0
Capital stock	$316,913,448	$230,230,014 +	$86,883,234	37.7
Bonds	485,278,871	292,609,10[illegible] +	193,669,431	67.4
Gross earnings	137,194,624	100,169,068 +	37,025,555	37.0
Net earnings	45,818,097	45,056,782 +	761,315	1.7
*Total income	49,271,240	48,295,954 +	975,286	2.0
Charges	28,807,956	21,367,432 +	8,440,433	39.5
Profit	19,463,335	26,928,172 —	7,253,898	27.1

* Net earnings, income from investments, etc.

Two of these companies, the Northwestern and the Burlington, have large investments in railroads which they do not work directly and none of the statistics of such railroads are given above, but the capital accounts of these two companies are largely increased by such investments. The capital, therefore, cannot properly be compared with their mileage as given above, but it can be with their income, which includes what these investments have yielded. A very large part of the Northwestern's additions to its system have been built by its controlled lines.

Returning to the tables we find that these six companies have an aggregate capital 282 millions greater than in 1882, but that their income, from which interest on this capital must be paid, has increased meanwhile by only the pitiful sum of $975,296, which is little more than one-third of one per cent. on the additional capital; and this is not by any means a fictitious capital. The stock of all these companies was above par and of most of them far above par in 1882, and the new issues have all, we believe, represented actual expenditures.

If we take the profit above the charges for interest and rentals—that part of the income from which dividends must be paid, and from which on these roads a large amount has usually been devoted to additions and improvements—we find that it has fallen off more than one-fourth in the ten years; in 1882 230 millions of stock had $26,900,000 of profits; last year 317 millons of stock had 19½ millions of profits.

The growth of traffic has doubtless been greater in proportion than the growth in mileage, through traffic especially having greatly increased in the past ten years; and even the gross earnings have increased largely (37 millions); but the increase in working expenses has absorbed about 98 per cent. of the increase in gross earnings. Yet there is no doubt that transportation is effected more economically on all the above railroads, under similar circumstances, than it was ten years ago. The difference is that several of them have a much larger proportion of mileage on which the traffic is very thin, and all of them have to carry their traffic at lower rates—their through traffic at very much lower rates.

Now this unfavorable result is not shown because last year was particularly unfavorable; on the contrary, it was the most favorable these railroads, as a whole, have had for several years. Their income fell off rapidly after 1886 for two years, just after the last epidemic of railroad building, and in 1888 (year ending with March, 1889, for the Rock Island, and with May, 1889, for the Northwestern) the increase of these six railroads, which had been $48,300,000 in 1882, had fallen to $35,600,000. The encouraging feature in the situation is the recovery since 1888. The income of these six railroads for the last six years has been:

1886-87	$48,474,455	1889-90	$45,1[illegible]0,798
1887-88	44,532,314	1890-91	44,855,868
1888-89	35,605,076	1891-92	49,271,200

The increase in capital had already been made, for the most part, by the year of smallest profits. In 1886-7 the share capital, which was 230 millions in 1882, had risen only to 271 millions, but in 1888 it was 296 millions; and the funded debt rose from 290 millions in 1882 to 371 millions in 1886 and 439 in 1888. While the comparison of last year with 1882, therefore, shows scarcely any increase in profit in the face of a tremendous increase in the property and the capital invested in it, the comparison with 1888 shows an increase of 13½ millions (38 per cent.) in profit, with an increase of only 65 millions (9 per cent.) in capital invested. If, however, we leave 1888 out of consideration, as exceptionally disastrous, we still have last year an increase in profits of $5,000,000, or more than 10 per cent. over either of the two previous years, with comparatively trifling increases in mileage or capital—an indication that these great systems, as a whole, are recovering from the shock which so profoundly affected them after 1887, even when we give due credit for the exceptional results due to last year's bountiful harvests.

At another time we hope to present the facts given above for the six railroads as a whole for each one of the six companies, which will enable us to judge better of the effect of the different policies of the different companies, one of which has made no additions to mileage, while others have added thousands of miles to their systems; and one of which has operated largely in a territory far separated from that of the others.

Uniformity in Block and Interlocking Signal Systems.

The Time Convention (this seems to be the only possible "short title" which is suitable for mentioning the semi-annual meeting of the American Railway Association) comes next week. The coupler question is not in the unsettled condition that it was at the time of the April meeting, and there will probably not be

much done about it except to present statistics. We may therefore expect the subject of fixed signals to be the most important topic before the Convention. This is so important, in fact, that a special session was to have been held at Chicago in the summer to consider that and nothing else; but we have heard nothing about the proposed special session since April, and the subject will have to be taken up now. To speak more precisely, it *ought* to come up now. Whether it will, and to any purpose, remains to be seen.

We have not seen or heard from the committees which have the matter in charge, but we conjecture that they "bit off more than they could chew." There is such a diversity of views on points which a good many American railroad men include in the term signaling that it was probably hard to decide upon what the committee wished to discuss at Chicago, not to mention the harder task of laying down any lines by which the discussion could be guided so as to profitably assimilate the very diverse views which would be brought out in a general meeting. A general exchange of views looking to ultimate uniformity of construction and practice, as far as may be found practicable, is highly desirable; there is great need of a special meeting, and it would have to be a long one, if the attendance were good; but there would be little hope of many members going home with any feeling of satisfaction at the progress made, and the committee, therefore, must have been considerably embarrassed. Meetings which seem to result in no progress are generally a necessity in any widespread movement like this, but no one wants to take the responsibility of appointing them without unanimous approval.

The diversity of views regarding signal apparatus and methods is greater than it was a few years ago; or, rather, it appears among men of more prominence; and it is well illustrated within a few miles of Chicago. When the Pennsylvania was the only road using the block system and the Union Switch & Signal Company furnished practically all the interlocking in the country there was an appearance, at least, of uniformity, for all other systems and kinds of fixtures cut a very small figure in comparison; but now we can find a considerable variety on a very few roads, and the new comers are by no means beneath notice. The Fort Wayne road uses the old or English block system. The Burlington has several miles of the automatic pneumatic block signals. The Chicago & Northwestern has the Hall wire-circuit automatic block and the Illinois Central has the Hall rail-circuit. Interlocking apparatus of the Johnson and the National companies is now common, and the Wuerpel company purposes to put in a large plant at Jackson Park. Diversity certainly exists, and may even increase. Many railroads take their lessons from the signal companies, and so they will learn diverse habits as well as use different kinds of signals. Diversity excites discussion; this stirs up the inventive superintendent or division engineer, and so we are in the way of having more and more alleged "new" inventions.

It is by no means true, however, that this state of things is an unmixed evil. The proper progress in a country the size of this is not likely to be accomplished by the efforts of any one man, firm or corporation, and if different persons work the field, differing methods are inevitable. It is deplorable that so many men waste their money and cumber the patent office with "inventions" that other people invented before these geniuses were born, and it is to be regretted that different roads, aiming at precisely the same object, will multiply patterns and standards unnecessarily and thus enhance expenses for years to come; but, aside from this, our present diversity will probably do more good than harm. It must be remembered that there is one important fact that makes variety in block systems inevitable, to wit., the determination of American railroad officers to operate a space-interval system automatically if possible. In the man-operated block system and in mechanical interlocking, it may be plausibly said that England has made the experiments and has perfected the main features, and that an American road is therefore reprehensible for making a new departure; that it should conservatively follow the settled principles that have been adopted in England. But in automatic devices America leads. No example is set us by the English or any one else. The field is yet new and in many features we must not expect settled principles. In such a comparatively new art it is not safe to assume that the era of invention has ended.

But this diversity is nearly all beneath the notice of the American Railway Association, after all; and the Association can go on with its work without unduly checking the progress which is expected to result from encouraging variety. It is not the province of the Association—at least not at present—to regulate those features of signaling in which diversity has lately appeared, and, with one exception, it can lay down its rules without in any way disturbing those who are responsible for the diversity. This exception is the use, by the Chicago & Northwestern, of green discs and lights to indicate all clear. Other roads use green to indicate caution, and the two systems cannot be made to work together. But a red disc and a horizontal semaphore arm may both be used on the same road for the same indication; a Wuerpel semaphore purports to give the same indications as any other semaphore; a semaphore giving night indications by the form (arrangement) of its lights is not inconsistent with one in which color is depended upon. These and other diversities which are undesirable are not unendurable. The best devices will probably kill off their rivals some time, but the present existence of both, side by side, does not preclude the accomplishment of much good by the establishment of rules which shall recognize both alike. Any rules for application throughout the country must at first be confined to very genera principles.

Many railroad officers, even those of considerable experience, seem to have inaccurate notions about numerous points in signal practice, and there is little danger of giving too much attention to the primary class. This vagueness of thought is largely due to careless habits in the use of terms, and the Association can do great good by defining, for instance, just what a block system is; wherein the permissive system differs from the absolute; what a distant signal is and what it is for. It should expose in strong light the fallacies involved in numerous erroneous terms that are in common use. The general rules for signaling, and the instructions for a great many local signals, are examples of most shiftless practice on a great many roads. The committee should make a report characterizing these in such plain terms that their sponsors will be compelled to reform them. In short, the Association should do the same thorough work on this subject that it did on the train rules, and thereby add another leaf to its laurels.

Freight Trains Partially Air Braked.

Within the last two or three years the practice of running freight trains, of which part of the cars are equipped with air brakes and part are not, has become so common that the dangers as well as the advantages of the practice are made clear by object lessons. A number of wrecks of such trains have been reported by the daily papers, and many others have not got into print. This danger was the basis of a strong argument made by a member of the M. C. B. Air Brake Committee when the rules for the proposed standard tests were made up. Even if the train is not actually wrecked, the damage to cars and loads caused by the sudden stopping of the front of the train by an emergency application of the brakes, when the rear part of the train is not braked, is likely to be considerable. A break-in-two in the air braked part of the train is very apt to cause a wreck, for the engineman is powerless to throw off the brakes on the front section and unable to pull that section out of the way of the rear. A case of this kind occurred at Burlington at the time of the air brake tests last summer. A train of about 50 cars broke in two in the air braked part. There were about 20 air braked cars in the front and 30 unbraked in the rear, and the break-in-two was just ahead of the line dividing the two classes of cars. The brakes were applied automatically on the front section, and the rear section ran into it and wrecked several cars.

Besides break-in-twos, the danger from slack alone is often serious on a long train. On the West Shore road a few weeks ago a freight train of two loaded and 64 empty cars broke apart ahead of the forward car. Forty-one cars nearest the engine were equipped with air brakes, and these stopped so suddenly that eight empty cars in the rear of the train were derailed. The engine got away safely, and the damage would have been the same if nothing but the hose had broken. The train was running about 25 miles an hour. In the case of the Burlington wreck, just mentioned, the train was not moving over 10 miles an hour.

It is by no means clear what is the best remedy for this difficulty. Several months ago, when the proposed tests for air brakes were being discussed, the question was brought up whether the present air brake is not too powerful and too quick in its action; but after considerable discussion it was decided by all interested that a quick acting brake was necessary in order to prevent collisions and other accidents to trains wholly equipped with air, and that making a brake slower in action and yet automatic would not materially mitigate the trouble caused by the brakes being applied on the front and not on the rear, when a train partly equipped with air brakes breaks apart in that part of the train having air brakes. To use the air only when the whole train is equipped would neutralize a large part of the advantage for which the large expenditure was made.

Practically all that can be done to guard against this danger is to prevent breakages of couplings and air brake hose. The inspection of these will need to be rigid and a conductor or brakeman using a weak link in a heavy train will have to be strictly disciplined. Conductors and enginemen whose trains frequently break in two on passing over summits are open to the suspicion that they do not know how to handle trains at such a place, and should be dealt with accordingly. The further danger, that of a smash in the rear part of a long train because the engineman stops suddenly on seeing danger in front is hardly susceptible of treatment by the issuance of orders. It may often turn out that the enginemen would save money for the company to knock over a $50 horse ($50 while alive, $500 when dead), rather than make an emergency application of the brake, but there is no use in trying to prescribe a course for him to pursue. He must act on the intuitions of the instant and we must trust to that action. Perhaps the most direct lesson of the accidents which we took for our text is to hurry the introduction of close couplers and to get rid of every careless engine runner.

Transportation to the World's Fair.

The problem of transportation to the World's Fair at Jackson Park from the city of Chicago, a distance of about 8½, miles is yet unsettled. None of the railroad companies or street car companies know how many people they can carry. The uncertainty lies in the limited amount of equipment available and in that unknown quantity—the minimum time between the departure of trains. Most of the roads entering Chicago will have an entrance of some sort to the grounds, but, of course, the main traffic from the centre of the city will have to be carried by the Illinois Central, the elevated road and the South Side cable lines.

The capacity of the Illinois Central has been estimated at various times, but each time differently. The capacity of the elevated road is believed to be in the neighborhood of 20,000 persons an hour. The cable road capacity is indefinite, as the limit of the power of the cable is unknown, and there is much uncertainty about the frequency of the departure of trains, the last being dependent largely upon the volume of street traffic in the vicinity of the terminal station. Where the cable line crosses main thoroughfares, the trains will be delayed considerably to allow vehicles, omnibuses, etc., to pass.

Some railroad managers are skeptical about the value and profit of running trains to the World's Fair grounds, but this feeling will change as soon as the large volume of traffic is appreciated. Particularly will this be so if the present fare of 35 to 45c. a round trip can be sustained. This fare is not from the city of Chicago, but from the suburban districts over the outlying connecting lines and the Belt Line.

The Chicago & Northern Pacific (Chicago Central) expects to run suburban trains to the fair grounds from the Grand Central Station. It expects to prepare gondola cars with seats and canopy top, the cars being suitable for use for freight work after the fair closes. Joint circulars are being prepared by the Illinois Central, Chicago & Northern Pacific and the Baltimore & Ohio, to passenger agents and general managers of connecting lines, stating terms on which the Chicago Central and other roads will haul trains and provide track facilities to the fair grounds. For various reasons it is impossible now to make an estimate of the transportation facilities as the steamboat capacity, the number of street vehicles that will be available, and the capacity of existing lines are unknown, but there will probably be means of transit into the grounds to take all the people who will go from the centre of the city to the grounds. The crowding will be more liable to occur in the southern residence portion of the city, where there will be a vast number of boarding houses and hotels, and from which there will be but few transportation facilities except those provided by street cars and wagons. After the opening exercises this month managers of transportation lines will be better prepared to give opinions on the capacity of existing lines and the need for an increase of equipment beyond that already projected.

The railroad postal clerks in the vicinity of St. Louis will ask the government to give them safer cars than the ones they are now obliged to work in, which are almost immediately broken into splinters when a bad accident occurs to a train. The position of the postal cars, next to the engine or the baggage car, exposes its inmates to the greatest danger of any persons on the train. When sleeping cars go through collisions and the occupants escape all injury the postal clerks argue that the cars in which they work ought to be made as safe as the sleepers.

The above item has been widely published by the Associated Press. Everyone will sympathize with the postal clerks. The collision at Kipton, O., a year and a half ago is still fresh in the memory of those familiar with the postal service, and the recent disaster at Shreve, in the same state, was nearly as bad. What to do to remedy the present state of affairs is a hard question, however,

A portion of the risk is inevitable. A position in the foremost part of a train is inevitably more dangerous in a butting collision than one farther back. The reason why sleeping cars escape damage is often simply the fact that they are in the rear portion of the train. If the postal cars were made stronger than the other cars in the train, the result would be to transmit the shock, or a larger portion of it, to the cars behind them. This would in many cases be nothing more than shifting the danger from the mail clerks to the express messengers or the baggage man or the passengers in the smoking car. It is common knowledge that smoking cars are quite likely to be the weakest in any given train, because it so often happens that they are old cars. The most rational reform in the make-up of trains would be to build all the cars in any given train of equal width, height and strength. The use of iron and steel in the frames may be made to lessen the danger to life in collisions, but the precise method of doing this to the best advantage is not yet well understood. These advantages as compared with the best timber construction are by no means so great for this specific purpose, as is often assumed. The combustibility of wood is rightly pointed out by the mail clerks as an important element to be changed or removed, but the use of wood is not an unmixed evil by any means. Some roads have abandoned iron frames for seats in passenger cars, partly because they cause more injuries to passengers in cases of wreck than wooden frames.

We have heretofore remarked upon the fact that the wishes of the public always constitute a relative quantity. If people ask for two cent fares, it is because they are familiar with three cent rates. Those who ride for one cent a mile are just as anxious to have the price reduced to five mills, and those who enjoy the latter rate think that one mill a mile would be about right. People who have trains every hour think that 10-minute intervals are the proper thing, and those who can take a train to any point once every minute think that it is the duty of the railroad to reduce the interval to 10 seconds. This is amusingly illustrated by the attitude of the San Francisco merchants toward the clipper ships which take freight to and from New York around Cape Horn. These ships have made rates much lower than anything afforded by the overland routes, and have, therefore, favored the merchants in a marked degree; but, if we may believe the headings in the newspapers, everyone is now exulting because the clippers have themselves been beaten by ships which take freight from New York to San Francisco by a still more roundabout route. This route has come to public notice in consequence of a case lately decided in the United States District Court at Los Angeles, Cal., which was begun to test the legality of shipping freight from New York to Antwerp, and thence by sailing vessel to California, the original destination being, in fact, San Francisco, and the roundabout route being selected because the total cost was cheaper than by direct line. The plaintiffs relied on the provisions of Section 4347 of the Revised Statutes, regulating coastwise commerce. The goods were regularly consigned to a Belgian house and then reshipped under a new bill of lading. The Court decided that the language of the law did not forbid this. It appears that the rate on nails in kegs was only about 30 cents per 100 lbs., while the rate direct from New York, around Cape Horn, at the same time was 65 to 70 cents.

The Chicago & Grand Trunk has notified the Chicago dressed beef shippers that it will pay only 2½ mills a mile for the use of refrigerator cars, the rate hitherto having been one cent. It is said that the dressed beef men, when their cars were not all in use, have been paying bonuses to other shippers to use refrigerator cars, thus virtually using a part of their mileage income to buy traffic to keep their cars running. As everyone knows, the amounts paid by the railroads for the use of private owners' cars have become so large under the existing mileage rates that the whole system has become a great abuse. The income on the cars is from 40 to 70 per cent. a year in many cases, and the money paid as mileage becomes virtually a rebate on the transportation rate, thus violating the law. We do not know the reason for the Chicago & Grand Trunk's action, and can only hope that it will have courage to carry out its intention. This long standing abuse is not to be abolished without a hard contest, however, and this is only one shot in the fight. It is announced that the Chicago Great Western has taken similar action toward the Street Stable Car Co., whose live stock cars are extensively used on that and other Western roads. It will need the combined action of all the large roads to make any headway against the private owners. The operating officers of the large roads already appreciate the evil, but they will have to get the combined attention of their general managers.

The Association of Railway Claim Agents has issued in connection with its report of the meeting at Detroit last June, a programme of the subjects to be brought up for discussion at the next meeting, which will be held at Nashville, Dec. 6, and also a list of the topics for the annual meeting, to be held at Buffalo, July 11, 1893. In This Association, of which Mr. L. L. Gilbert, of the Pennsylvania Company, is President, is a body of railroad lawyers and claim agents who adjust personal claims, land claims, etc. It does not give attention to ordinary freight claims. Among the roads represented in it are the Atchison, Topeka & Sante Fe, Baltimore & Ohio, Cincinnati, Hamilton & Dayton, Denver & Rio Grande, Grand Trunk, Lake Shore & Michigan Southern, Missouri Pacific, New York & New England, Pennsylvania lines west of Pittsburgh, Union Pacific and four of the principal Chicago roads. Among the subjects in the lists above mentioned are: Should the claim agent be governed by "sense of justice," or "cents of coppers?" What is the sentiment in regard to paying attorneys of claimants fees as inducement to fair settlement? The value of accident statistics to railroad companies and claim agents. Should the corporation take steps to settle for accidents before presentation of claim? Is it better to compromise a claim or to pay the same amount in court costs? What difference should it make where claimant has always been a friend to the company, or is a "patron" of the road; and is it policy to decline the claim of a patron when no liability exists?

NEW PUBLICATIONS.

Master Car Builders' Association, Report of Proceedings for 1892. The Report of the Saratoga Convention of the M. C. B. Association was published last week. We do not see that it differs from former reports in any way, and of course our readers know perfectly well what sort of a document it is. It may be as well to add, however, that it can be obtained from Mr. John W. Cloud, Secretary, The Rookery, Chicago, Ill., and that the price is $1.50. We do not find that these facts appear anywhere in the Report.

Poor's Directory of Railroad Officials and Manual of American Street Railways, 1892. New York: H. V. & H. W. Poor, 70 Wall street.

This is the seventh annual number of the Directory of Officials, and certain new features have been introduced. One is a full list of directors of railroads, banks, insurance companies and other corporations arranged alphabetically. The names of the railroad officers indexed, which number about 10,000, besides appearing under their corporations, are gathered in a separate alphabetical list, making it very easy to find the name of any individual. The department of street railroads includes statements for lines of nearly 10,000 miles length, which is an increase of 1,088 miles since the last edition.

The Tariff. Its Bearing upon the Industry and Politics of the United States. By Henry V. Poor, New York. H. V. & H. W. Poor, 70 Wall street. 1892.

Mr. Poor is well known as the editor of "Poor's Manual," as the author of a "History of Railroads," and by other work of special interest to railroad men. As to whether or not his pamphlet on the tariff will have any interest to them, we cannot judge, having neither the time nor the inclination to read it. Doubtless it is intended to be a timely addition to campaign literature, and as such it will have a certain field and some human interest.

Recent Progress in Electric Railways. By Carl Hering. 12 mo., pp. 390. New York: The W. J. Johnston Co., 1892. Price $1.

The name of the author is a sufficient guarantee that this little volume will be found to be of great practical use and value, although the author (or, rather, the compiler) says, "Most of the material has been taken from the columns of one journal." Some of the chapters are Construction and Operation, Conductors, Storage Batteries, High-speed Inter-urban Railroads, and Generators, Motors and Trucks.

The South Atlantic Railroads.—The October number of the *Cosmopolitan* contains the first of a series of articles on the great systems of railroads in the United States. This one is on the South Atlantic system and is written by Mr. H. B. Plant, President of the Plant Investment Company.

The Journal of the Franklin Institute for October has an article on "Maximum Stresses in Three-hinged Arches," by Mr. Emrick A Warner. It has also articles on Automatic Engines by Prof. Thurston, and on Burning Fuel Oil by the use of Compressed Air, by Mr. W. S. Collins.

TRADE CATALOGUES.

Wood-work ng Machinery.—Illustrated and Descriptive Catalogue of the Egan Co., Cincinnati, O.

This is one of the handsomest trade catalogues that we know of. It has 267 pages, 9 × 12 in. in size, besides a number of folding pages. It is well indexed, and gives a cipher telegraph code. We cannot attempt to tell what the catalogue contains, there are so many illustrations of wood-working machinery in general and in detail. It would be easier to say what it does not contain; and still the publishers tell us, that business requirements have forced them to issue it earlier than they had intended to, and that therefore they have been obliged to omit a number of new machines, such as car-boring machines, a dimension planer, a car sill dresser and an end-tenon and gaining machine. The company is now in a position to equip a railroad shop almost complete with everything but iron working tools, engines and boilers, and to give tools embodying the very latest ideas for fast and perfect work.

The Abolition of Grade Crossings.*

This subject now occupies the attention of engineers and the general public to an important extent. As a general thing there is about one grade crossing to a mile of railroad in the more thickly settled portions of the United States. In the State of Massachusetts this is almost exactly the average. Most of these were established when the railroads were built for want of funds necessary to separate the grades; and as a general thing the city as well as the country roads cross at grades. In a few cities, as for example New York, Philadelphia, Baltimore and Rochester, a good deal of work has been done, but these are very few in proportion to the whole. About all the problems remain to be solved.

Literature on the subject is scarce. We have at present six American engineering reports and the comments and discussions thereon by the engineering journals; and also there are various short articles in the annual reports of the railroad commissioners of Massachusetts, Connecticut and New York. English engineers have not written much on the subject, or, if they have, it has not become very widely known, as inquiry among them fails to find anything. The "Descriptive Index of Current Engineering Literature," lately issued in book form (Association of Engineering Societies), seems to contain only one allusion to the subject.

In 1887 and 1888 reports were made by the city of Buffalo on a portion of the grade crossings in that city by the railroad commissioners of New York, and also by a board of engineers. In 1888 the State of Massachusetts took up the matter and a commission of engineers, consisting of George A. Kimball, William O. Webber and the writer, made a report in 1889 setting forth plans and approximate estimates for the relief of eight cities and fourteen towns, and urging that the policy of establishing new grade crossings be stopped, and that the work of separating the grades should go forward according to some systematic plan. So far as is known to the writer this is the first general report ever made on the subject. The railroad commissioners of Massachusetts have reported from time to time, but have confined themselves to recommendations as to the numerous methods by which the crossings might be made safer without separating the grades. Recently, numerous cities have taken the matter up and engineering reports have been made to the city of Worcester, to the city of Chicago, to the city of Buffalo and to the city of Atlanta.

In separating the grades in the United States the writer desires to place stress on the point that the work must be gradual. The present state of things has been many years in its growth and a very large amount of money and a very long time will be required to correct it. The railroad companies proceeded in accordance with the popular will in establishing the crossings, and probably had no expectation of ever being called upon to make a change. And now that a demand is arising for a change, fairness seems to require that it should be carried out slowly and in such a way as to unreasonably burden none of the parties.

With reference to the creation of new grade crossings, the necessity for them except for private use seems to have about ceased in this state. Within the past five years very few have been granted and, as showing that railroads can be built without them, attention is called to the Wrentham Branch of the Old Colony and to the Brookline & Pepperell railroad, both recently completed without any grade crossings in Massachusetts.

Work in cities should be commenced on a systematic plan. The first work done often will determine the general method which must be employed afterward. For instance, if one or more streets are carried over the tracks there cannot be any change made there subsequently in the grade of the tracks without damaging or destroying altogether the work already done. There is a popular notion which is found to prevail in certain quarters that the proper way to get rid of the dangers and annoyances from grade crossings is to remove the stations and the tracks out into the suburbs of the city. This has been done in a very few cases in the United States. No idea could be more erroneous. The whole tendency of the railroads in most of the great cities of the world is to extend as far into the centre of business as possible, and examples of this may be seen in Liverpool and London and in our own country in Philadelphia, where millions have been expended for this purpose. The business of transportation, like any other business, is for the accommodation of the patrons thereof, and such a thing as the removal of the passenger or local freight yards out of the city to a greater distance away from the centre of business should not be thought of for a moment.

The public will have to pay the expenses of all such improvements. When an improvement is general, coming somewhat uniformly on the railroads, the burden has to be borne by the people at large for whom the railroads do business. And the question may properly arise whether the public can afford the expense. In reply to this it may be answered that in communities like the state of Massachusetts, for instance, the inhabitants have advanced far beyond the necessity of con-

*From a paper read before the Boston Society of Civil Engineers Sept. 21, 1892, by Augustus W. Locke, Member of the Society.

lishing themselves continuously to getting food and protection from the weather, and are in a condition to have many things which a settler in a new country would not expect. The English have afforded these improvements from the very beginning of their railroad system. We are richer than they in many ways; we seem to afford elegant stations and cars which cost a small fortune apiece and probably we can afford to have the crossings abolished gradually as the opportunity presents itself.

The present law of Massachusetts seems to be giving good satisfaction. Its provisions are briefly that cities and towns and railroads may petition the superior court for the abolition of any crossing, and that the commonwealth shall contribute from 25 to 35 per cent. of the expense of doing the work. Under this law this abolition of over 70 crossings has been petitioned for within the last two years.

With reference to gates, they are a poor protection as used in the United States. The foreign system is much better. When gates are used they should be impassible, and they should admit of only one kind of traffic at a time. When open for street traffic there should be interlocking signals that stop, for the time being, all railroad traffic. The doctrine which is sometimes advocated that a warning is all that ought to be provided, is a barbarous one. People should be taken care of both at grade crossings and at stations, and their energies should be directed to other matters, involving less anxiety for their own safety, especially so, when well known remedies are within reach.

La Guaira and Caracas Railroad.*

This railroad runs from the port of La Guaira on the Caribbean Sea to Caracas, the capital of the republic of Venezuela, which is a city of about 75,000 inhabitants, situated at an altitude of 3,000 ft. above the sea level. The distance is only 22¾ miles, and in order to attain this elevation the line has had to be built with a ruling gradient of 1 in 26¾, rising to a height of 3,200 ft. shortly before reaching Caracas, and then falling 250 ft. to the terminus; the chief peculiarity of its construction is the extreme sharpness of the curves, the generality of which have a radius of 250 ft., while one has as little as 140 ft. radius.

The line is single, with sidings for the passage of trains that meet. Its gauge is 3 ft., and the traffic, of which by far the largest portion is up grade, is hauled by locomotives without any centre-rail. When the coffee crop is poor there is little or no traffic down to La Guaira, and many wagons go down empty. The track winds up the mountain side with yawning precipices on one side and towering heights on the other. In some places it runs through cuttings 70 ft. deep, alternating with short tunnels, of which there are eight, bored through the solid rock, the longest being about 120 yds. in length; and the continual turning on the steep gradient, and on the edges of precipices, where there is sometimes a sheer drop of 1,200 ft., is alarming to passengers when first traveling by it. Mr. de Lesseps, after traveling upon it, remarked of the line that there was only one danger on it, but that was continuous for the whole distance from La Guaira to Caracas. It is, nevertheless, the fact that, notwithstanding the really dangerous character of the railway, there has not been a single accident to passengers during the eight years it has been in existence, and only one case of a break-away on a goods train. This, however, is due to the unceasing vigilance of the employés, who know that they carry their lives in their hands, and also to the use of a very effective brake.

Owing to the sharpness of the curves, the driver often cannot see 20 yds. in front of him, and men called "vigilantes" are stationed at intervals all along the track on the lookout for impediments, and for any threatening slip of earth, their duty being, in the event of danger, to notify it at the nearest telegraph, the whole of the working arrangements, and of the meeting of up and down trains, being conducted through the telegraph offices. Excepting at the Caracas station, there are no signals.

The landslips are very frequent during the rainy season, which lasts about six months. As many as 202 have been known to occur during one night, and this is a constant source of danger. Sometimes the trains have been imprisoned for three days between two huge landslips. On one occasion, the slips were so numerous, that on the whole track there were not 400 consecutive yards of clear line remaining unincumbered, and the traffic was stopped for a fortnight. On another, two bridges were washed away, and a third much injured, and the traffic was interrupted for a week. Many of the cuttings were originally made with slopes which approached the perpendicular, although half of them are in loose earth, without any rock support. The present manager, Mr. George Ross, is, however, making great improvements. The plan he has adopted is to cut away the outside wall of those cuttings which are near the edge of the mountain side, leaving the road on that side exposed. Then, when slips of earth occur from above, the rubbish is expeditiously removed by shoveling it over the edge of the precipice, instead of having to haul it out at one end or other of a deep cutting.

It has been found necessary, with the very sharp curves on this line, to give more super-elevation to the outer rail than ordinary practice warrants—in some cases, as much as 4½ in.; and the author was surprised to see it recently stated (*Engineering*, Dec. 25, 1891, p. 753) that a committee of French engineers appointed by the Minister of Public Works, among other conclusions, had decided that super-elevation of the outer rail in curves, even for high speeds, was unnecessary, and in fact a cause of instability rather than otherwise. As originally constructed by Messrs. Perry & Co., the line had rails of 40 lbs. per yard; but these are now being replaced by steel rails weighing 50 lbs. to the yard, 24 ft. in length, single headed, of Vignoles section, spikes to sleepers made from an extremely hard and durable wood of the country called Vera (a species of greenheart), 7 ft. by 9 in. by 4½ in., and 2 ft. apart from centre to centre.

The quantity of locusts that infest the line is so great that they frequently stop the trains. Even when only a few are crushed, the rails and wheels become so greasy that adhesion is destroyed, and slip occurs to such an extent that the trains often run back down the incline. Experiments have been made to clear the rails of them by means of a steam jet, and also by fixing brushes to the cowcatcher; but owing to the sharpness of the curves, and the frequent reverse curves, neither plan has proved effective. The only remedy at present in use is sanding the line, placing a man for the purpose in front of the engine; but the platelayers have orders to do the same wherever the locusts are thickest, and also to brush them off the rails as much as possible.

The nature of the line limits the number of vehicles that can be hauled to a very small number. The goods trains are composed of three wagons nominally loaded with 10 tons of freight, although usually carrying more; the average weight of the train, including tare of wagons, but exclusive of engine, being 45 tons. On one occasion, however, with a new engine, a load of as much as 95 tons has been hauled from La Guaira to Caracas. The passenger trains consist, as a rule, of four coaches and a van, but even this number, especially when there are locusts on the line, occasions trouble on the sharp curves, the length of the train causing stress across the chord of the arc, or curve, which is trying to both the line and the rolling stock.

For fuel, patent blocks (Crown brand) are used, it having been found that Welsh coal destroyed the fire-bars too quickly. These blocks cost at La Guaira, £1 18s per ton, and are admitted free of customs duty. Experiments several times repeated have shown their evaporative efficiency, with the locomotives used on this railway, to be equal to 8 lbs. of water per pound of fuel; but the consumption varies much according to circumstances and to the skill of the drivers; the present general average is about 60 lbs. per mile.

A variety of causes add to the working expenses of the line. The large quantity of sand which penetrates the machinery obliges the brasses and other parts to be refitted every three weeks, and causes so much wear and tear on the tires that those of the bogies have to be renewed every six months. Leakage of the boiler-tubes is continual and very troublesome. This the author attributes partly to the high pressure of from 145 lbs. to 160 lbs. on the square inch, and partly to the shocks which the engines sustain almost every minute as they pass from one curve to another; for, notwithstanding the slow speed at which the trains run on the average (two hours being allowed for the 22¾ miles), the passenger trains attain at times a speed of 18 miles an hour. The shocks shake down the fire-brick arches, which rarely last more than a fortnight, so that a large stock is required for renewals.

The engines are 18 in number, and are practically all of the same type. That now adopted is the simple six-wheeled coupled, outside-cylinder, tank-engine, with a bogie at the trailing end, weighing, when in working order, from 34 to 35 tons. The tanks hold 600 gals. of water, and the coal-bunkers 1 ton of coal, some of the blocks of patent fuel being packed in addition on the foot-plate, and on the top of the tanks. The cylinders are 1 ft. 3½ in. in diameter, having 1 ft. 8 in. length of stroke; the wheels, 3 ft. in diameter, thus giving a tractive force of 133.5 lbs. for each pound of effective pressure per square inch of piston. The engines are provided with a steam brake and with a hand-screw brake. The coupled wheels are brought as close together as possible, the centre ones being without flanges; the brake blocks are applied to all six wheels. The driving and centre wheels are ¾-in., and the trailing wheels 1-in. slack to gauge; the bogie has a lateral play of 3 in. on each side, the wheels being 1 ft. 10½ in. in diameter, and the tires 2½ in. thick by 5½ in. wide; those of the pony trucks are 2 ft. 7 in. in diameter.

All the carriages and wagons are supplied with a Heberlein brake, worked from the engine only, an extra man being placed on the foot-plate for this purpose; the same man also attends to the sanding of the line when locusts are numerous. Most of the stock is also fitted with a hand-brake, but this is rarely used, reliance being placed, as a rule, on the Heberlein friction brake.

The railroad has a constantly increasing traffic both in passengers and goods; and, whereas formerly it was considered a good day's work to bring up from La Guaira 12 freighted wagons, now as many as 42 are frequently taken up.

* By Edwin Harry Alfred Heinké, Assoc. M. Inst. C. E. From Selected Papers of the Institution.

TECHNICAL.

Manufacturing and Business.

The Berlin Iron Bridge Co., of East Berlin, Conn., is building a new machine shop for the Mather Electric Co., at South Manchester, Conn. The building will be 52 × 150 ft., the central portion being 35 ft. in width and controlled by a 15-ton traveling crane. The design is a combination of iron and wood—all the heavier parts of the building being of iron.

The Biwabik Ore Company, of Duluth, has ordered four steam shovels from the Bucyrus Steam Shovel & Dredge Company, and will use them for removing iron ore from the Biwabik mine and the Mesaba range.

The Mountain Iron Company, of Duluth, Minn., has ordered from the Marion Steam Shovel Company one steam shovel for immediate delivery and two to be delivered later in the year.

The Builders Iron Foundry, of Providence, R. I., has recently shipped for test at Sandy Hook the first of the eight 12-in. mortar carriages for which they have a contract with the United States Government. The total weight of each carriage is about 42 tons.

D. Pottinger, Moncton, N. B., Chief Superintendent of the Intercolonial railroad, is calling for tenders for the purchase of rails and scrap iron in the following quantities: 700 tons serviceable second-hand steel rails, 56 lbs. to the yard, with bar plates; 800 tons scrap steel rails, 600 tons scrap iron rails, 600 tons cast iron car wheels, 300 tons wrought iron scrap and 50 tons scrap brass.

Application has been made to the New Brunswick Legislature for the incorporation of the Portland Rolling Mills Co., of Canada, by Messrs. E. R. Burpee, J. P. MacIntyre, J. C. Robertson, James Mowatt and C. J. Coster. The headquarters of the company will be at Coldbrook, N. B., and the capital stock $200,000.

New Stations and Shops.

The Great Northern is building a frame passenger station at Casselton, N. D. The dimensions are 32 × 96 ft.

The office building of the Great Northern, at Havre, Mont., has been completed. The structure is two stories in height and 33 × 46 ft. in dimension. It contains offices for superintendents, train dispatchers and other officials, and a reading room for employés.

The contract for building a five stall addition to the Great Northern round house at Grand Forks, N. D., has been let to J. L. Bjorquist, of Minneapolis.

Testing Laboratory at Two Harbors.

The Duluth & Iron Range is building a three-story brick laboratory at Two Harbors, Minn. The dimensions are 24 × 40 ft., and the building will contain an equipment for chemical and physical tests. New ore crushers will be put in and power will be furnished by a Paine automatic high-speed engine built in Elmira, N. Y.

A Dredging Contract.

A $2,000,000 contract has just been let in New York for dredging and constructing jetties at the proposed deep-water harbor of Ropes Pass, Tex. The work consists of a ship channel 30 ft. deep, extending from the 30 ft. depth in the Gulf of Mexico to Corpus Christi Bay, across Mustang Island. A channel 9,200 ft. in length has been dredged across Mustang Island to within 803 ft. of the Gulf beach.

The Canadian "Soo" Canal.

The Dominion Government has come to an agreement with Hugh Ryan, contractor for the Canadian Sault Ste. Marie Canal, by which he binds himself to have the canal completed by the opening of navigation in 1894, two years ahead of the contract time. It is understood that the hurrying of the work will cost about $250,000 in addition to the original contract price.

A Hydraulic Lift Bridge for Chicago.

It is proposed to build a hydraulic lift bridge at Halsted Street, Chicago, which will be lifted by cables to a height of 140 ft., to permit the passage of vessels. The estimated cost is $137,000. It was proposed to have the work done by Mr. J. A. L. Waddell, but at a recent meeting of the City Council it was decided to advertise for bids for construction.

Proposals for a Ferry Boat.

The Dominion Government is calling for tenders to be received up to Oct. 18, by the Chief Superintendent of the Intercolonial road at Moncton, N. B., for the construction of a steam ferry boat. Plans and specifications are to be seen at Moncton. The steamboat is to be completed and delivered not later than April 30, 1893.

Electrical Notes.

The motive power of the elevated steam railroad in Kansas City operated by the Interstate Consolidated Rapid Transit Railway Co. is being changed to electricity, using the trolley system. A cable feeder line running from the business part of Kansas City, Mo., to the eastern terminus of the elevated road, has already been changed to an electric road. It is reported that the same company will get control of the Tenth street cable line and make it part of the electric system.

Armour & Co. have constructed an elevated electric railroad connecting different parts of their establishment at the stockyards in Chicago, which is probably the first extended elevated electric road to be built in this country. At present 6,000 ft. of 3-ft. gauge track is finished, and plans are made for an extension of about two miles more. The track is 23 ft. above the surface of the ground, and the elevated structure is built of steel where it runs between the main buildings, and elsewhere is of Georgia pine. The overhead trolley is used, and the electrical plant has been installed by the Thomson Houston Co. The cars used have but four wheels, which have broad flanges, so that they may be run off the rails on to the floors in the different houses. The amount of product handled over this road will average 400,000 lbs. per day, and by its use the services of 150 men are dispensed with. When the extensions to the coaling station are completed, the working force can be still further reduced, to the extent of 10 horses and carts and 15 more men.

The *Western Electrician* states that the extension of electric roads in New England is developing a new feature in summer resort travel all along the New England coast. A road is being equipped between Lynn and Salem which will complete a chain so that it will be possible to ride from Boston to the shore at Salem Willows without change. This is a distance of about 19 miles. Competing lines on which electricity is the motive power help to keep the passenger tariff on the steam roads down, and are thus building up the suburbs of Boston very rapidly. For example, the West End electric road carries passengers to Arlington for five cents, a distance of seven miles. The Merrimac Valley road now connects the principal cities of that valley. There is also a road in Natick. A line from Boston to Natick and thence to Framingham and Worcester is under consideration.

The long litigation over the ownership of the patents covering the incandescent electric lamp has just been decided in the United States Circuit Court of Appeals, Justices Wallace, Lacombe and Shipman sitting. The decision is in favor of Mr. Edison and confirms the decision of Justice Bradley in the McKeesport case in 1889. The Edison Company will now expect to recover large sums from the other companies. Mr. Westinghouse tells the reporters that his company will not be hampered by the decision.

A franchise has been granted to the Calumet Street Railway Co., and the South Chicago City Railway Co.,

for a double track overhead electric line on Stoney Island avenue from Sixty-fourth to Seventy-ninth streets, with lines on Sixty-seventh and Seventy-ninth streets to connect with the lines of the Chicago City Railway Company on Cottage Grove avenue.

Feed-Water Analyses on the Great Northern.

Mr. Conradson, chemist for the Great Northern Railway, is engaged on a systematic series of analyses of the water used for locomotive purposes over the entire Great Northern system. There are between 250 and 300 water stations on the Great Northern lines, and as water is taken from several wells at some of these stations, about 1,000 analyses will be required to complete the work. No general scheme has been formulated by which all classes of water will be treated, but it is probable that in some cases a system of purification by evaporation and condensation in stationary evaporators will be used, similar to that in use in marine service. It is not intended to establish a system of chemical compounds to be used in the locomotive boilers, as Mr. Conradson's view is that the purification should take place before the water is put into the boiler at all, or if practicable that better water should be substituted.

Heavy Hydraulic Forging.

The Fox Pressed Steel Co. has recently made two steel pans for use in Chicago in a galvanizing works, which are of special interest on account of their great size. The plates from which the tanks are pressed are each 21 ft. long, 6 ft. wide and 1 in. thick, and therefore each weighs about 5,160 lbs. These are pressed into a U-shaped cross-section 2 ft. 6 in. deep. The pressing is done on a hydraulic forging press having four rams 36 in. in diameter and on which a pressure of 850 lbs. is used. The total pressure used in pressing one of these sheets is therefore about 1,700 tons.

Interlocking at Minneapolis.

The Union Switch & Signal Company has the contract for erecting a 25-lever plant at Twelfth street, Minneapolis, for the Great Northern. This plant protects the crossing of the Great Northern and the Minneapolis & St. Louis, and includes 18 switches.

The Coal Business in the Northwest.

While the magnitude of the coal distributing business which is carried on at Western lake ports such as Duluth, West Superior, Milwaukee and Washburne cannot be fully appreciated except by a visit to these points, it is of interest to note that the amount handled at West Superior and Duluth is about 1,600,000 tons yearly. The tonnage capacity of the docks of the various companies at these ports amounts to about 1,250,000 tons. Of the total amount handled, from 60 to 65 per cent. is bituminous coal, the rest of course being anthracite. The coal shipments from Buffalo for this season to date amount to nearly 1,798,000 tons.

The West Superior Steel Works.

The Bessemer department of the West Superior Iron & Steel Co. is principally engaged at present in manufacturing steel plates, angles and deck beams for the American Barge Co., the builders of the McDougal whalebacks. The foundry department of the West Superior Iron & Steel Co. is at present casting large quantities of culvert pipe for northwestern railroads, as well as a large amount of cast water pipe and gas pipe. The greater part of the pig iron used by these works is made in blast furnaces in West Duluth.

Lake Shipbuilding Notes.

The American Barge Co. at present has three whaleback steamers in process of construction at the yards at West Superior, one of which is intended for passenger service at Chicago between the Lake Front and Jackson Park during the World's Fair. This company will probably turn out 11 vessels during 1892, aggregating nearly 14,000 tons. Their new dry dock, which is the largest one on the lakes, is now occupied by the steamer Neshoto.

THE SCRAP HEAP.

Notes.

The Chicago & Northwestern has advanced the wages of some local freight train men.

The Northern Pacific will soon establish a system of watch inspection. Giles Brothers & Co. are the chief inspectors.

The work of lining the Coosa tunnel of the Columbus & Western is still unfinished, and it is said that regular trains will not be run through for a month yet.

Grand Master Sweeney, of the Switchmen's Mutual Aid Association failed of re-election at the annual meeting Sept. 29, but he was chosen Editor and Manager of the *Switchmen's Journal*.

The Connecticut Railroad Commissioners have made their regular inspection of the Philadelphia, Reading & New England, and report that the road has been poorly maintained during the past year. The track between Hartford and Simsbury is in bad condition.

The Lima car works, at Lima, O., were destroyed by fire on Sept. 28, except the foundry and foundry office. Loss $50,000, insurance $40,000. Two hundred and ten cars were destroyed. The gross loss is estimated at $100,000. Three Union tank line cars loaded with oil exploded, shaking the town. A disastrous fire occurred in the Nickel Plate freight yards at Eightieth street and Stony Island avenue, Chicago, on Sept. 30. Forty carloads of merchandise were burned. The engine and car house of the Bath & Hammondsport Railroad, at Hammondsport, N. Y., were burned Sept. 29. Several cars were badly damaged.

The strike of the telegraph operators on the Burlington, Cedar Rapids & Northern was declared off Oct. 1. The settlement cannot be said to be a victory for either side. The operators secured the recognition of their order, and all existing vacancies will be filled from the ranks of the men who struck; all others who have not been guilty of violence or destruction of the company's property will be returned to work as soon as vacancies occur. It is further provided that if the operators should again want to consider the question of wages a committee may present the matter to the proper officials of the company, and they will treat with the employés.

Railroad Commerce Congress.

The committee having in charge the arrangements for an International Railroad Congress at Chicago in 1893, beginning June 19, has issued a preliminary list of topics to be discussed, and invites criticism upon it. The chairman of the committee is George R. Blanchard, chairman of the Central Traffic Association, Chicago. The list is as follows:

The original development and present condition of railroad commerce in different parts of the world.

The influence of railroad commerce on the settlement and development of the countries.

The practical results of railroad commerce to producers, carriers and consumers.

The proper elements of the cost of safe and efficient service.

The practical effects of free competition in the construction and operation of railroads.

The proper protection of the private rights and interests involved in strikes, and what should be done in the way of prevention and control.

Railroad employés; what should be done for their protection and improvement.

Railroad accidents; their causes and the practical safeguards against them.

Railroad receiverships, the practical lessons they teach.

Governmental regulations of transportation and practical results thereof.

Freight traffic; special contracts, limitations of common law liabilities, clearing-houses, traffic pools, etc.

Interstate and international arrangements; their practicability, the best means for their promotion and their influence on the commerce, peace and prosperity of the world.

New York Coupler Law.

The New York State Board of Railroad Commissioners will hear applications on Oct. 17 for one year's extension of the time in which railroads in the State are required to equip their freight cars with automatic couplers.

A High Nile.

The rise of the Nile is above the normal and much anxiety is felt as to its effect in Lower Egypt. Energetic measures are being taken to provide against floods from broken dykes. A breach in the Ibrahimieh Canal has interrupted the service on the Upper Egypt Railroad.

Mexican Railroads.

President Diaz, in his annual message to the Mexican Congress, says:

"The improvement in our railway system is noteworthy, not only as regards the progress of construction on new lines but also in the expansion of existing ones. The railways are thus able to afford a more powerful impulse to our industrial development, as well as to multiply our transportation facilities and thus co-operate in overcoming the evils of a season of short crops like the present. And here it is right to make public mention of the disinterestedness and spontaneity with which the principal railway and steamship companies have volunteered their services toward the relieving of the scarcity of provisions. The railway system now measures over 10,660 kilometres, and the increase since April has exceeded 200. A large part of this increase is to be credited to the Mexican Southern Railway, which at present only lacks a little more than 40 kilometres to reach Oaxaca, a point to which the line in question will undoubtedly be completed before the end of the year. The International has made even better progress, and is rapidly approaching Durango. The Hidalgo Railway is also progressing, the grading having been completed as far as Tulancingo. The Lower California Railway Co. has built 17 kilometres, making 27 in all. Construction work on the Tehuantepec Isthmus Railway has been carried on without interruption, and there is every reason to hope that it will be completed within the term of 15 months agreed on in the contract."

The World's Fair Floats.

The floats which were at one time to be an important feature in the dedicatory exercises at Chicago and which cost $77,200, were finally disposed of by burning them on the lake shore at Jackson Park.

The Railroads of New South Wales.

The annual report of the Railway Commissioners, for the year to June 30, 1892, has just been submitted to the Legislature. During the 12 months the property has been considerably improved out of working expenses. The traffic increased very satisfactorily up to the end of February, the increase at that date being £145,069. The general depression at present affecting the colonies then began to make itself felt, and the year closed with an increase of £132,875 only. The tramway traffic, although checked in its growth, has not been so seriously affected by the depression as the railroad traffic. The general money result for the year was as follows: Total traffic, railways and tramways, £3,412,386; total expenditure, railways and tramways, £2,162,843; net return after paying working expenses, £1,249,543, being an increase in net profit over last year of £53,322, and making an accumulated increase in net profits paid into the Treasury during the past four years of £1,255,923. Since 1888 the gross earnings on the railroad had increased by 35.39 per cent., and the net earnings by 54.04 per cent. On the tramway the gross earnings showed an increase of 28.99 per cent., and the net earnings 226.15. The drought in the far West and the ravages of the rabbits will, it is feared, materially affect the wool traffic, but, generally speaking, the weight of wool to be carried during this season is expected to equal last year's business. The total length of line opened for traffic on July 1 was 2,266 miles. The Culcairn-Corowa line is excluded from this calculation. The revenue derived from working the lines during the year was £3,107,295, and the expenses amounted to £1,914,252, or 61.60 per cent. of the gross revenue, leaving a net revenue of £1,193,044 toward paying interest upon capital, or a return of 3.58 per cent. upon the total cost of the railways open for traffic. On the city and suburban tramways the percentage of profit to capital invested was 5.54.

Moving a Water Station.

Owing to the scarcity of water at Brenham, Tex., the tank of the Houston & Texas Central at that place was recently removed to Ralston's Creek, a mile and a half east. Not only the tank but the framing and all was moved at one time. Mr. Rogers, the roadmaster, had two cleats bolted to the framing about 4 ft. from the bottom, one on either side, at right angles with the track; then when all the trains were out of the way in the early morning hours, he had two platform cars placed on the track beside the tank. Then by means of jacks and block and tackle he raised the tank from its foundation and hauled it, frame and all, to those two cars, where it was safely deposited, each cleat on the framing resting securely on sills placed under them, each end of these sills on the end of a platform car. The two cars were then fastened together and the big tank moved off hanging between the cars like an acrobat balancing on parallel bars. At its destination it was safely unloaded and was ready to supply water to trains the same day.

"All Hopping Northwest."

This season's frog story is dated Little Falls, Minn. We do not learn whether the frogs had tails, but the story has been fitted out with a tail-piece which affords great comfort to the people who live in New York and other places on the southeast side of Little Falls. Besides this there are other pleasing verbal changes from former editions. "A pest of frogs has come upon this town. For days the streets and sidewalks have been covered with them, so that it is almost impossible to keep from stepping on them. A train on the Little Falls and Dakota road was delayed two hours on account of them. The frogs are so thick on the track that hundreds are crushed and the rails become slippery. The reptiles are all hopping in a northwesterly direction."

LOCOMOTIVE BUILDING.

The Biwabik Ore Co., of Duluth, Minn., has ordered three switching engines from the Pittsburgh Locomotive Works, to be delivered on April 1.

The Delaware, Lackawanna & Western has ordered a 10-wheel compound locomotive of the Vauclain type, with a wide firebox, from the Baldwin Locomotive Works. The cylinders are 13½ and 23 × 24 in.

The Duluth, Mesaba & Northern has placed an order with the Pittsburgh Locomotive Works for twelve 50-ton Mogul locomotives. These are to be delivered in the middle of November and will be used in freight service.

The Duluth, Mesaba & Northern has ordered from the Pittsburgh Locomotive Works twelve 19 × 26 in. 10-wheelers and three switching engines. Three of the 10-wheelers are to be delivered before Dec. 1 and the balance of the order on April 1.

The Brooks Locomotive Works have built a tandem four-cylinder compound for the Great Northern and are testing it on the Lake Shore & Michigan Southern. They have delivered 50 heavy engines to the Great Northern and are at work on 25 more. Delivery of these will begin this month.

BRIDGE BUILDING.

Annapolis, N. S.—Hon. T. R. Jones, member of the New Brunswick legislative council, is endeavoring to form a company to build a bridge from Annapolis to Granville, N. S.

Brockville, Ont.—For some days past Engineer Smellie has been making surveys from the Brockville, Sault Ste. Marie & Westport railroad bridge, over the Grand Trunk tracks, and across Smith's Island with a view to ascertaining its suitability as a site for the proposed international bridge to Morristown, N. Y. The work is being done under instructions from the Brockville & New York Bridge Co. and the American company that has the charter in the United States.

Elgin Corner, N. B.—The tenders were opened last week for the bridge at Elgin Corner, Albert County, but the contract has not yet been awarded.

Ferndale, Wash.—The Commissioners of Whatcom County (Wash.) have let the contract to the Pacific Bridge Co. for the construction of the drawbridge across Nooth-sack River, at Ferndale. It will be of steel, according to the plans submitted by the company. The contract price is $14,275.

Hamilton, Ont.—A resolution has been passed by the city council ordering a conference with the officers of the Grand Trunk to consider the building of a new steel bridge on Barton street.

Purdy, Wash.—The County Commissioners of Pierce County have just awarded the contract for the construction of a wooden drawbridge across Henderson Bay, at Purdy, to H. Keys and C. F. Burgeson, for $3,000.

St. Cloud, Minn.—The plans for the bridge across the Mississippi River have been adopted. It will be a substantial steel structure 570 ft. long, roadway 28 ft., and two sidewalks each 6 ft. wide. Frank Smith, City Engineer, has charge of the work.

St. George, N. B.—Construction on the bridge at St. George, for which Simmons & Burpee have the contract, has commenced. The old bridge is being torn down and preparations made for placing the stone abutments for the new structure.

Toronto Junction.—The consulting engineer has reported unfavorably on the tender of the Hamilton Bridge Co. for building an overhead bridge at McMurray avenue, and it is recommended that the tender of P. & J. Brown be accepted.

Toronto, Ont.—A movement is on foot looking to the early construction of a bridge to connect this city with Hanlan Island. C. H. Keefer, C. E., of Toronto, says: "There are two ways in which a bridge might be built at or near the Queen's Wharf. A low level swing bridge, which could be opened for boats in a minute's time and which would be perfectly feasible as well as financially practicable, or a high level bridge, high enough to clear the masts of vessels in the channel, which would, of course, entail a long and expensive

structure, but which I believe could be built, assuming that it carried all the summer traffic, so as to be a commercial success, if viewed from the standpoint of a dividend-earning investment.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Supreme Court of North Dakota decides that the statute providing that in lieu of any and all other taxes upon the property of any railroad company, etc., there shall be paid a certain percentage "of all the gross earnings of the corporation owning or operating such railroad, arising from the operation of such railroad, as shall be situated within this territory," refers only to the earnings arising from traffic within the state, and is not unconstitutional, as imposing a tax on the earnings derived from interstate commerce[1].

The Federal Court rules that the dominion of a court over a railroad sold by its decree entirely ceases upon the conveyance thereof to the purchasers[2].

In Pennsylvania the Supreme Court decrees that the statute which provides that domestic "railway" companies may lease railroads applies to passenger "railway" companies not operated by steam.[3]

In Texas the Supreme Court decrees that the jurisdiction of the court over a receiver is ended when he is discharged and the property returned, and an order, in a decree discharging him, that such property shall be relieved from liability on claims not established by intervention in the suit in which the receiver was appointed does not affect the liability of the corporation for personal injuries received while the receiver operated the road, when it has received in the form of improvements earnings out of which damages for such injuries should be paid, although the claim is not established by such intervention.[4]

The Supreme Court of Texas holds that the statute providing that where a claim not exceeding $50, for stock killed, shall be presented, etc., and not paid within 30 days, the claimant may recover, in addition to the claim, the fee of an attorney, if one is employed, not exceeding $10, is not in violation of the bill of rights, providing that property, etc., shall not be taken without due process of law.[5]

The Federal Court holds that the purchase by a railroad company of another road, which was parallel to it, was illegal and void, under the paragraph of the Constitution forbidding one corporation to make any contract with another tending to defeat or lessen competition in their respective businesses.[6]

In Missouri a railroad company executed a mortgage on its entire line of road between designated points, "as said railroad now is or may be hereafter constructed, maintained, operated or acquired, together with all the privileges, rights, franchises, real estate, right of way, depots, depot grounds, side tracks, water tanks, engines, cars and other appurtenances thereto belonging." The Supreme Court rules that the mortgage covered land subsequently purchased by the company near a depot on the line of road mortgaged, and a hotel erected thereon, for the purpose of an eating-house and to accommodate the employés of the company, passengers and other persons.[7]

In Ohio the Supreme Court decides that under the state statutes regulating railroad companies and authorizing any such railroad company to charge such reasonable rates for the transportation of freight for a less distance than 30 miles as it may from time to time fix, but providing that at any time after the expiration of 10 years from the time such road may be put in operation it shall be lawful for the general assembly to prescribe the rates to be charged if deemed too high, provided that no reduction shall be made unless the net profits of the company, on an average, for the previous 10 years, shall amount to a sum equal to 10 per cent. per annum "upon its capital," the word "capital" means the capital stock; and railroad companies incorporated under that act, or by special act which confers upon the company the powers, and makes it subject to the restrictions and provisions of that act, whose net profits on an average of the 10 years next previous to the passage of the act of March 30, 1875, amounted to a sum equal to 10 per centum per annum upon the actual capital stock of the company are bound by the provisions of the last named act, reducing the rates which may be charged for the transportation of persons or property upon the road of such company.[8]

In Texas an action for personal injuries was begun against a receiver, pending which the receivership was terminated, the road restored to the company, and the company made a party defendant to the action. There was no evidence that the earnings of the road while in the hands of the receiver had been applied to the betterment of the road. The Supreme Court holds the company not liable.[9]

In Georgia the chief officer of the department of the railroad service to which plaintiff belonged, by an official circular, prescribed plaintiff's duties, among which were the following: "He will compile the monthly rate-sheets, and see that all business of this branch is properly conducted." Plaintiff, after the promulgation of this order, compiled the monthly rate-sheets for several years, during which he received his regular compensation as an employé of the company. The Supreme Court rules that such compensation is to be taken as covering his services in compiling the rate-sheets, as well as all other services laid down in the circular.[10]

In Florida, the Supreme Court holds that a railroad corporation, though under the laws of Florida it has the right to erect and maintain docks as incident to its business, and to hold or dispose of them as may be deemed proper, cannot, when engaged in the business of common carrier, lease the terminal point of its railroad track on its dock in a navigable stream to a steamboat company, and thereby defeat the ingress and egress to and from its track on the part of competing steamboat companies.[11]

The Supreme Court of Michigan rules that a statement in the articles of association of a railroad company that it shall be operated as a transfer road, and no discrimination shall be made against any road, and that uniform rates for the same services shall be charged to either persons or railroad companies, does not show that the carriage of passengers was excluded from the purposes of its organization, especially where the articles state that the organization is for the purpose of constructing, operating and maintaining a railroad of standard gauge, etc.[12]

Injuries to Passengers, Employes and Strangers.

In Vermont the Supreme Court rules that where a passenger on defendant's excursion train secures a seat for himself, but afterward resigns it to a lady, and after remaining in the aisle of the car for some time goes out on the platform intending to enter another car, but finding that full remains on the platform, from which he falls, or is thrown off, he is guilty of contributory negligence since he was not compelled to stand on the platform.[13]

In Kansas it is held by the Supreme Court that where a person in purchasing a ticket at a railroad station contracts a contagious disease from the ticket agent the railroad company is not liable in damages, unless it be shown that it, or its superior officers, knew that the agent had the disease.[14]

In New York a ticket agent, acting under a notice given him by police officials to look out for a $5 counterfeit, and describing three men passing the same, supposing a bill presented at his window by plaintiff in payment for tickets to be one of the counterfeits, and supposing plaintiff and his companion to be the persons described, after giving plaintiff his tickets and change, sent for a police officer and directed their arrest while they were seated on the station platform waiting to take the train. The officer stated that he knew the two men as reputable men, and that there must have been a mistake; but the agent insisted upon their arrest for passing counterfeit money, and they were arrested, but were after an hour discharged, the bill passed being pronounced genuine. The Supreme Court rules that the agent was acting without the line of his duty in taking the bill which he supposed to be counterfeit, and causing the arrest; and, it not appearing that plaintiff was at the time of his arrest in the agent's custody, or under his protection, with respect to the execution of the contract of transportation, defendant could not be made liable for his conduct.[15]

In Massachusetts the Supreme Judicial Court rules that since the brakeman and the men who make up trains are fellow-servants, a railroad company is not liable for an injury to the former occasioned by the use of too short a pin in coupling cars, when, by the undisputed evidence, a pin of the proper length could have been easily obtained in the yard or from the caboose of the train.[16]

The Supreme Court of Illinois holds that placing a car in motion on a track where it is known that men may be, without any person being in the car, and without any means of stopping it, is evidence tending to prove negligence, although there is no public crossing at the place.[17]

In Missouri the Supreme Court holds that a child playing on a railroad track where it crosses a street is not a trespasser.[18]

In New York it is laid down by the Supreme Court that it is negligence in a railroad company to propel a hand-car past a station at the rate of 15 miles an hour, on a down grade, without bell or other notice of approach, at an hour when passengers are about to gather to take a train.[19]

[1] Northern Pac. R. Co. v. Barnes, 51 N. W. Rep., 386.
[2] Central Nat. Bank v. Hazard, 49 Fed. Rep., 293.
[3] Rafferty v. Central Traction Co., 23 Atl. Rep., 884.
[4] T. & P. R. Co. v. Railway, 18 S. W. Rep., 481.
[5] Gulf, C. & S. F. Ry. Co. v. Ellis, 18 S. W. Rep., 723.
[6] Hamilton v. S., F. & W. Ry. Co., 49 Fed. Rep., 412.
[7] O. & St. L. R. Co. v. Wabash R. Co., 18 S. W. Rep., 1,101.
[8] Iron Ry. Co. v. Lawrence Furnace Co., 30 N. E. Rep., 616.
[9] T. & . R. Co. v. Hoffman, 18 S. W. Rep., 741.
[10] Smith v. C. R. & B. Co., 14 S. E. Rep., 567.
[11] Indian River Steamboat Co. v. East Coast Transp. Co., 10 South. Rep., 480.
[12] Bay City Belt Line R. Co. v. Hitchcock, 51 N. W., Rep., 808.
[13] Worthington v. C. V. R. Co., 23 Atl. Rep., 590.
[14] Long v. C., K. & W. R. Co., 28 Pac. Rep., 977.
[15] Mulligan v. N. Y. & R. B. R. Co., 29 N. E. Rep., 952.
[16] Thyng v. Fitchburg R., 30 N. E. Rep., 169.
[17] L. S. & M. S. v. Hundt, 30 N. E. Rep., 458.
[18] Tobin v. M. P. Ry. Co., 18 S. W. Rep., 906.
[19] Conklin v. N. Y. C. & H. R., 17 N. Y. Rep., S. 651.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware, Lackawanna & Western, quarterly, 1¾ per cent, payable Oct. 20

New York Central & Hudson River, quarterly, 1¼ per cent., payable Oct. 15.

Toledo & Ohio Central, quarterly, 1¾ per cent. on the preferred stock, payable Oct. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Albany, annual, Albany, N. Y., Oct. 10.

Atchison, Topeka & Santa Fe, annual, Topeka, Kan., Oct. 27.

Chicago, Havana & Western, annual, Chicago, Oct. 11.

Chicago, Madison & Northern, annual, Chicago, Oct. 11.

Chicago & Springfield, annual, Chicago, Oct 11.

Cincinnati, Lebanon & Northern, annual, Cincinnati, O., Oct. 11.

Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 26.

Concord & Montreal, annual, Concord, N. H., Oct. 11.

Denver & Rio Grande, annual, Denver, Col., Oct. 18.

Evansville & Terre Haute, annual, Evansville, Ind., Oct. 17.

Great Northern, annual, St. Paul, Minn., Oct. 13.

Housatonic, special, Bridgeport, Conn., Oct. 18, to approve of the lease to the New York, New Haven & Hartford.

Illinois Central, annual, Chicago, Ill., Oct. 12, to consider an increase of stock from $45,000,000 to $50,000,000.

Kankakee & Southwestern, annual, Chicago, Oct. 11.

Louisville, New Orleans & Texas, special, New Orleans, La., Sept. 30, and annual, Oct. 3, to consider a consolidation with the Yazoo & Mississippi Valley.

Manhattan, annual, New York City, Nov. 9.

Manitou & Pike's Peak, annual, Manitou, Col., Oct. 15.

New Orleans & Northeastern, annual, New Orleans, La., Nov. 2.

New York, New Haven & Hartford, annual, New Haven, Conn., Oct. 19.

New York, Pennsylvania & Ohio, annual, Cleveland, O., Oct. 12.

Northern Pacific, annual, Mills Building, New York City, Oct. 20.

Ohio & Mississippi, annual, Cincinnati, O., Oct. 13.

Philadelphia, Newtown & New York, special, Norristown, Pa., Nov. 28, to consider an increase of bonds to $1,600,000.

Pittsburgh & Western, special, Alleghany, Pa., Oct. 14, to consider an increase of stock to $1,500,000.

St. Paul & Duluth, annual, St. Paul, Minn., Oct. 13.

St. Paul, Minneapolis & Manitoba, annual, St. Paul, Minn., Oct. 13.

Western Maryland Tidewater, annual, Baltimore, Md., Oct. 19.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Railroad Superintendents* will hold its twenty-first meeting at the Hotel Brunswick, Fifth avenue and Twenty sixth street, New York City, on Monday, Oct. 10, at 10:30 a. m.

The *American Railway Association* will hold its fall meeting at No. 24 Park place, New York City, on Wednesday, Oct. 12, 1892, beginning at 11 a. m.

The *Roadmasters' Association of America* will hold its next annual meeting at Lookout Mountain Hotel, Chattanooga, Tenn., having been postponed from Oct. 18, and adjourning to the Kimball House, Atlanta, Ga., beginning Nov. 15.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 500, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

American Society of Civil Engineers.

At the meeting held on the evening of Sept. 21, the paper on "The Strength and Weathering Qualities of Roofing Slates," by Mansfield Merriman, M. Am. Soc. C. E., was read by the author. A brief discussion followed by C. B. Brush, M. Am. Soc. C. E.

The second paper was on "Test of Power Taken to Drive Electric Street Cars," by Louis B. Bonnett, Jun. Am. Soc. C. E. Mr. Brush, in discussion, mentioned the importance of determining the loss of power in transmission from the station to the car. In the use of the trolley system, a company with which he was connected used at first a return circuit of copper wire, and they

found a loss of power in the transmission of about 10 per cent. The return wire was stolen, and they then grounded the ends of the remaining wire, when the loss on a length of 1¼ miles was reduced to less than one per cent. Charles E. Emery, M. Am. Soc. C. E., thought the paper valuable, and one showing much care in its preparation. It was not applicable to motors now used, which were much more powerful and developed higher efficiency.

The third paper was by Alfred F. Sears, M. Am. Soc. C. E., on "Motive Power for Street Railways." Written discussions were presented by E. N. Kirk Talcott and H. W. Brinckerhoff. The former favored the direct application of steam to motors, and prophesied its success. Mr. Brinckerhoff presented a report of the Birmingham Central Tramways Company, of Birmingham, England, which uses, on different lines in the same city, locomotives, horses, cables and electricity. The figures, both as to cost per mile run, including all fixed charges, and also revenue per mile run, favor the cable system. Mr. Dodge, the inventor of the Chicago steam street car, described his system. It is a simple locomotive receiving a charge of steam and water at 400 degrees Fahr. With this and the consumption of 37 pounds of anthracite coal, it will travel 20 miles, carrying a load of passengers, the pressure during this run being reduced from 165 to 135 pounds. Mr. Emery commented on this, that such a motor for long steep grades becomes a locomotive and has all its disadvantage of weight. The heaviest grade yet overcome by electric motors was one of 14 per cent., at Richmond, by double reduction motors. At Reading, Pa., 22,000-lb. cars with motors of 55 H. P. make a speed of 9¼ miles per hour on a 3.5% per cent. grade.

At the meeting of Wednesday, Oct. 5, the programme included a paper on "Combination Bridge Building on the Pacific Coast," by Alfred D. Ottewell. By the term "combination" the author means bridges in which wood and iron, or wood and steel, are used; those members in compression being chiefly of wood, and those in tension of metal. Howe trusses, suspension and arch bridges are barred out. The system of webbing used is generally the Warren, Pratt or the Petit form, the Pratt up to spans of 200 ft., and the Petit for greater spans, the webbing system being superior in the latter. The amount of inclination given to the top chord is a vexed question. For spans up to 300 ft. parallel chords between end hip connections are preferable. The reason for building such bridges on the Western coast is the abundance of excellent timber, and the high charges for freight on iron, etc. As an example of the system, the cantilever bridge across the North Umpqua River in Oregon is described and illustrated. The shore arms are 147 ft. each, the river arms 105 ft. each, and the suspended span 80 ft. The method of erection is also discussed. An estimate of the saving by using these bridges is made by supposing one 22-ft. panel of a top chord to be subject to a strain of 300,000 lbs.; the saving on this panel of the chord is estimated at $113.80 by using this combination rather than a steel panel. Another example briefly described is the bridge across the Salinas River in California.

The second paper of the evening was "Some Notes on Foundation Experiences," by A. P. Boller, M. Am. Soc. C. E. An abstract was printed in the *Bulletin* of July 1.

The following letter was duly received from Prof. E. A. Fuertes, Member of the Society, who was a regularly appointed delegate to the Congress named:

"As delegate to the International Congress on Internal Navigation, held in Paris, I have the honor to report that 'the Society' was honored by my election, as such delegate, to the office of First Vice-President of the 'Economic Section,' this being an honor to which no personal merit of mine could have aspired. Also, I have to report that the general secretary, M. de Mas, Chief Engineer des Ponts et Chaussées, at my request promised to send for the library of the Society a complete set of all the publications of the Congress. The meetings were of marked value and interest, and one of the best papers read, and containing thoughtful and well-digested matter, was presented by our colleague, Mr. North. . ."

Central Railway Club.

The Central Railway Club met Sept. 28 with President Eugene Chamberlain in the chair.

The meeting was the first held since the usual summer vacation, and in calling the members to order President Chamberlain said it had seemed well that on this occasion a study should be made of the inter-change rules as revised by the M. C. B. Association, as had been the usual custom when such revision was made. Some important changes had been made. Reports would also be presented by the committee on publication and the special committee appointed to confer with the Buffalo Association of Railroad Superintendents relative to the interchange of cars for local delivery.

Propositions for printing an official report of the club's proceedings from the Courier Company and the *Railroad Car Journal* were presented by Secretary Spear. Mr. Bonnar moved that the subject matter be referred to a special committee, with instructions to close a contract with the Courier Company, and secure as much advertising as possible to lessen the cost of publication. The motion prevailed and the president appointed Secretary Spear and Messrs Potts and Petrie as the committee.

Superintendent Mackenzie, from the special committee to confer with the superintendents, reported they had been unable, for various reasons, to have a meeting, but they hoped to do so at an early date. The committee was given further time, with instructions to report at the next meeting.

After an exchange of ideas regarding practice under the interchange rules and their interpretation, Mr. Mackenzie took occasion to say that though the committee to confer with the Superintendents had been continued, he thought they had accomplished all they could and the matter was now with the Club. It was his opinion that something could be agreed upon under which the improvement sought could be secured.

Mr. Chamberlain said the New York Central accepted 70 per cent. of the cars offered for local delivery, but where only chalk marks were used there was danger of these being washed off in a rainstorm and the cars would get into New York Central shops. He suggested that a motion be made to the effect that the Committee notify the superintendents that cars for local delivery will be accepted, provided they are properly carded for defects and returned to the owners empty.

Mr. Bonnar failed to see what the Central Railway Club had to do with a matter of no special interest except to a few local roads. He moved, as a sense of the meeting, that while the club was willing to concur in any arrangement made, it did not seem to have the right to do anything more than to assent to the acceptance of a car for local delivery provided it bears the M. C. B. defect card, with an additional card directing that it be returned to the owner empty.

Mr. Mackenzie was desirous that the inspectors should sign the additional card.

Mr. Chamberlain was opposed to this, and insisted that it should be attached by some other individual. This was agreed to, and the motion as thus amended carried.

President Chamberlin announced as the subjects for the next meeting, "What may be considered home defects on freight cars; defects that may be passed to owners by inspectors?" The following committee was appointed to prepare the report: A. M. Waitt, E. D. Bonnar, R. C. Blackall, J. R. Petrie and W. H. Raymond. The next meeting will be held in November.

International Brotherhood of Railway Track Foremen.

The first convention of this association was held in Kansas City last week, 200 delegates being present. John T. Wilson is President.

Roadmasters' Association of America.

The dates upon which the next convention of the Roadmasters' Association of America will be held have been changed to Nov. 15, 16 and 17 on account of the large number of members of the Association who are employed on roads centring in Chicago, and who, owing to the immense traffic over their lines before and after the Columbian Exposition opening ceremonies, cannot leave their posts of duty.

Switchmen's Mutual Aid Association.

The Convention of this Association at Dallas, Tex., last week elected the following officers: John W. Wilson, of La Crosse, Wis., Grand Master. Directors: W. R. Davis, Joliet; H. R. Humboldt, Chicago; M. R. Hutchinson, Chicago; John Tally, St. Louis.

PERSONAL.

—Mr. Paul Thurlow, a former director of the Pennsylvania Railroad, died at Sewell, N. J., last week.

—Mr. C. J. Williams, Master Mechanic of the Central of New Jersey, at Communipaw, resigned last week. It is understood that he was dissatisfied with recent reductions made in his force.

—John M. Kennedy, a director of the Cambria Iron Co., died last week at Bryn Mawr, aged 86 years. He has for years been a director of the Pennsylvania Railroad, being first elected to represent the stock owned by the city of Philadelphia.

—Mr. I. J. Naughton has resigned his position as Train Master of the Delaware division of the New York, Lake Erie & Western. He is about 32 years old and has been connected with the Erie for many years as telegraph operator, train dispatcher and train master.

—Mr. E. A. Westcott, who has been for several years Division Master Car Builder of the Chicago, Milwaukee & St. Paul, at Minneapolis, has been appointed superintendent of the St. Cloud car shops of the Great Northern. Mr. Westcott received handsome presents from the shop employés and his fellow officials on the road.

—The directors of the Monterey & Mexican Gulf road appointed Mr. C. A. Merriam, now General Superintendent of the road, to succeed Mr. J. A. Robertson who has been connected with the road since its organization. Mr. Robertson says that as Receiver he will retain possession of the property, notwithstanding the action of the directors.

—Mr. Howard James has been appointed Superintendent of the Minneapolis Union, succeeding H. V. Dougan, resigned. Mr. James was Secretary to Allen Manvel when he was General Manager of the St Paul, Minneapolis & Manitoba, and was subsequently Treasurer of the Eastern of Minnesota and later Division Superintendent of the Great Northern.

—A press dispatch from Montreal stating that Mr. E P. Hannaford, Chief Engineer of the Grand Trunk with headquarters at Montreal had resigned, and that Mr. Joseph Hobson, now Chief Engineer, with headquarters at Hamilton, would succeed him received extensive circulation in the daily newspapers this week. We have the best authority for stating that this report is unfounded.

—Mr. M. L. Robbins has been appointed General Passenger Agent of the Houston & Texas Central to succeed Capt. A. Faulkner, who goes to the Missouri, Kansas & Texas. Mr. Robbins has been in the company's service for 12 years, and was on the Hannibal & St. Joseph for eight years, and Chief Clerk of the Missouri, Kansas & Texas before becoming connected with the Houston & Texas Central.

—Mr. J. D. Hawks, Chief Engineer of the Michigan Central, has resigned that office to take the position of manager of the Detroit Citizens' Street Railway. This went into effect Oct. 1. Doubtless Mr. Hawks knows what he is about and has bettered himself in some way, but a large number of railroad men will be sorry to lose him from their ranks, and will find it hard to see how he can have improved his position, which has long seemed a very enviable one. At any rate, Mr. Hawks leaves his mark on railroad engineering. Few of those who have stuck strictly to the civil engineering side of railroading have done more to stir up thought and discussion and to carry fresh ideas into practice than Mr. Hawks. He is very keen, courageous and resolute, and brimful of energy, and whatever position he occupies he is there a living force.

—Hon. B. F. Chadbourne of Biddeford, the new Railroad Commissioner of Maine, appointed to succeed the late R. L. Bowers, of Saco, commenced railroading at the early age of 15 years. In 1869 he joined the engineer corps on the Portland & Ogdensburg. Afterward he worked on the Eastern Railroad a year, then went to New Jersey on the Pennsylvania for a year. He returned to Maine in 1873, and read law, going into active practice at Waterboro. In 1881 he went south to work for the Erlanger syndicate in the construction of their lines of railroads, first having charge of earthworks and afterward being inspector of iron and steel structures. He returned to Maine in 1885, and went into law practice at Biddeford. He represented Biddeford in the House of Representatives in 1889-91, and was elected by the last legislature a member of the State Board of Assessors, which position he now holds.

ELECTIONS AND APPOINTMENTS.

Abbeville Southern.—The incorporators are J. B. Long, J. B. Ward, J. J. Gissendaner, H. H. Martin, Z. W. Laney, Robert Newman, J. W. Foster, P. A. McDaniel, N. W. Thornton and W. J. Lee, all of Henry County, Alabama.

Atlanta Elevated.—The organization of the company was effected last week in the law office of Lewis & Green in the Equitable building, Atlanta, Ga., and the following officers were elected: Ex-Gov. Rufus B. Bullock, President; E. M. Blalock, Treasurer; E. L. Corthell, Consulting Engineer; H. T. McDaniel, Chief Engineer, and Frank J. Hoyle, Secretary.

Boston & Albany.—At the annual meeting just held the following directors were chosen: William Bliss, John Cummings, Zenas Crane, Edward L. Davis, Chauncey M. Depew, Edward B. Gillett, Edward D. Hayden, Samuel Hoar, Moses Kimball, Jacob C. Rogers, James A. Rumrill, Charles S. Sargent and John P. Spaulding. The board will not formally organize until next month.

Cumberland Valley.—At the annual meeting of the stockholders Oct. 3, Col. Thomas B. Kennedy, of Chambersburg, Pa., was re-elected President, and the following Board of Directors chosen: Thomas B. Kennedy, Chambersburg; George B. Roberts, J. N. Dubarry, Philadelphia; John Stewart, Chambersburg; John P. Green, Philadelphia; J. Herman Bosler, E. B. Watts, Carlisle; H. H. Houston, Philadelphia; W. W. Jennings, Harrisburg; A. J. Cassatt, Philadelphia; M. C. Kennedy, Chambersburg.

Duluth, Mesaba & Northern.—J. B. Hanson has been appointed Auditor, with headquarters at Duluth, Minn.

Fitchburg.—The following 11 directors were chosen at the annual meeting, Sept. 28, and will form the board of directors for the year, together with the three directors to be appointed by the state of Massachusetts, H. S. Marcy, Robert Codman, Rodney Wallace, C. T. Crocker, F. L. Ames, George Heywood, W. S. Webb, Francis Smith, W. H. Hollister, W. A. Russell, E. C. Thayer.

Great Northern.—E. A. Westcott has been appointed Superintendent of St. Cloud Car Shops vice W. V. S Thorne, resigned.

Houston & Texas Central.—M. L. Robbins has been appointed General Passenger and Ticket Agent, vice Capt. A. Faulkner, resigned.

Hudson River Tunnel Co.—The stockholders at their annual meeting in New York, Oct. 4, elected M. J. Currie, Joseph J. Schmidt, and A. Proctor, directors, in place of Messrs. Sooysmith, Ritter and Lorch. The other directors were re-elected. There has been no work done on the tunnel since a year ago last June.

Illinois Central.—John T. McBride has been appointed Superintendent of the Chicago terminals. The following changes will take effect on the Chicago division on account of the new terminal arrangements: The office of Horace Baker, Division Superintendent, will be removed from Chicago to Centralia, Ill. C. A. Holt, having resigned, the office of Assistant Division Superintendent has been abolished.

Louisville, New Orleans & Texas.—John T. Savage, formerly conductor of the road, has been appointed Superintendent of the Riverside division of the road.

Mexican National.—W. H. Mealy has been appointed Superintendent of the San Luis division with headquarters in San Luis Potosi, Mex., vice J. L. Williams, resigned.

Michigan Central.—A. Torrey has been appointed Acting Chief Engineer of this company, vice J. D. Hawks, resigned. His office will be at Detroit, Mich.

Minneapolis & St. Louis.—The annual meeting of the stockholders was held at Minneapolis Oct. 4. The vote cast was about 75,000 shares. The directors elected were William A. Read, of Vermilye & Co.; J. Kennedy Tod and William H. Truesdale. Before the stockholders' meeting the old directors met and elected William L. Bull, Edward S. Isham and William Strauss in the places of Messrs. Bishop, Langdon and Clarke. The stockholders' committee have a majority of the new Board of Directors. The new board subsequently elected William H. Truesdale, President; William A. Read, Vice-President; William Strauss, Treasurer, and Joseph H. Gaskel, Secretary.

Minneapolis Union.—Howard James has been appointed Superintendent vice H. V. Dugan, resigned.

Newport News & Mississippi Valley.—W. H. Prouty for several years General Passenger Agent, has been succeeded by Thomas Lynch, formerly of the St. Louis Southwestern, at St. Louis. The office of General Freight Agent has been abolished, Benjamin F. Mitchell, having resigned.

Pecos Valley.—Charles S. Ludlam has been appointed Auditor and Cashier, vice E. F. Draper, resigned. S. S. Satchwell has been appointed General Freight and Passenger Agent, in charge of traffic and claim matters, both with headquarters at Eddy, N. Mex.

Philadelphia & Reading.—Superintendent W. Bertolette, of the Shamokin division, will succeed C. M. Lawler as Superintendent of the Williamsport division, with office at Williamsport, Pa.

Quaker City Elevated.—The directors of this company include August Belmont, Jr., of the New York Banking firm; Gen. James Jourdan, President of the Kings County Elevated Road; Charles B. McMichael, Assistant City Solicitor of Philadelphia; R. M. Galloway, President of the Mechanics' Bank of New York, and Alfred C. Harrison, of Harrison, Frazier & Co. Charles W. Buchholz is President and Chief Engineer. The company's offices are at the Girard Building, Philadelphia.

Richmond & Danville.—The following changes of organization are announced by the General Manager: The Richmond & Danville Division will consist of the Richmond, York River & Chesapeake road; Richmond & Danville, Richmond to Greensboro; and the Milton & Sutherlin. The North Carolina Division will consist of the following mentioned roads: North Carolina; Northwestern North Carolina; North Carolina Midland; Yadkin, High Point, Randleman, Asheboro & Southern; Oxford & Clarkesville; Oxford & Henderson; Richmond & Mecklenburg and State University. J. S. B. Thompson has been appointed Superintendent of the Richmond & Danville, Virginia Midland and Washington & Ohio Divisions, with office at Richmond, Va. The North Carolina Division will be under the control of Edmund Berkeley, as Superintendent, with office at Greensboro, N. C. The office of Assistant to the General Manager, formerly held by J. S. B. Thompson, as well as that of Acting Superintendent of the Virginia Midland and Washington & Ohio divisions, has been abolished. T. O. Troy has been appointed Assistant Superintendent of

the Virginia Midland and Washington & Ohio divisions, with office at Alexandria, Va., and as such will perform the duties heretofore assigned to the Master of Trains. That office has been abolished.

St. Clair Tunnel Co.—The company elected officers last week as follows: President, L. J. Seargeant: Chief Engineer, James Hobson, of Hamilton, Ont.; Secretary and Treasurer, Robert Wright. The directors are: L. J. Seargeant, James Hobson, Alex. Vidal, Chas. McKenzie, John Bell, W. J. Spicer and F. W. Meddaugh.

Sebasticook & Moosehead.—William G. Nevins, of Waterville, Me., the son of George Nevins, of Brunswick, Roadmaster of the Main Central Railroad, has been appointed Superintendent of this road to fill the vacancy caused by the recent death by accident of Lafayette Hoxie.

Shelton Southwestern.—The following is a list of the directors of this new company: John Snyder, A. J. Hayward, Edmund Rice and Allen C. Mason, of Tacoma, and E. E. Crowell and H. S. Tremper, of Shelton, Wash.

Terre Haute & Indianapolis.—On Oct. 1 this company began to operate the Terre Haute & Indianapolis as its Peoria Division. I. H. Burgoon has been appointed Superintendent, Peoria Division, in charge of Transportation and Maintenance of Way, with office at Decatur, Ill., and will report to the Vice-President and General Manager. John H. Sessions has been appointed Freight and Passenger Agent, Peoria Division, with office at Decatur.

Toledo & Ohio Central.—L. D. Kelly, of Charleston, W. Va., now Auditor of the Kanawha & Michigan, has been elected Secretary and Treasurer, vice John T. Cline, resigned, and John Landgraf, Jr., late Auditor of this road, has been transferred to the Kanawha & Michigan.

Washington & Columbia River.—The following directors were elected at a meeting at Walla Walla., Wash., Sept. 24: F. W. Paine and Levi A. Kenny, of Walla Walla; Platt A. Preston, of Waitesburg, Wash.; D. C Guernsey, of Dayton; W. D. Tyler, of Tacoma; Samuel P. Sturgis, W. S. Byers and J. L. Killian, of Pendleton, and C. B. Wright, Jr., of Philadelphia. The board organized by the election of W. D. Tyler, President; C. B. Wright, Jr., Vice-President; A. R. Zabriskie, Secretary, and Charles Herman, Treasurer. The largest stockholder of the new company is C. B. Wright, of Philadelphia.

Western Maryland.—Mayor Latrobe, of Baltimore, has appointed John B. McDonald, a director to represent the interest of the city in this road.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Abbeville Southern.—This company was incorporated in Alabama last week to build the road from a point on the Alabama Midland, through Henry County, to the county seat, described two weeks ago, J. B. Long and other residents of Henry County, Ala., are the incorporators.

Atlanta Elevated.—A company was organized in Atlanta last week, and it is stated that as soon as the permission of the City Council is obtained work will be begun on the elevated road in Atlanta. It will be built from the Georgia railroad to the Central of Georgia and Atlanta & West Point roads, traversing the southern portion of the city, and giving a connection with these roads.

Bangor & Aroostook.—About a thousand men are now engaged on the line, and the grading, culvert building, etc., is going on rapidly. The principal work is now being done on the line between Houlton and Crystal, Me. The sub-contract for grading ten miles above Houlton has been awarded to W. O. Johnson. He has about completed all the work on the line below Houlton.

Burlington & Missouri River.—The local paper report that the extension now being built through Wyoming will be running into Sheridan, Wyo., by Nov. 1. There are about 3,000 teams and about 5,000 men on the grade, and work is being pushed vigorously. The only difficult piece of construction is a deep cut of half a mile near Sheridan. It seems probable that the new road will follow the old stage route along the base of the Big Horn Mountains beyond Sheridan.

Burrard Inlet & Fraser River.—The election in Vancouver, B. C., on Sept. 24 on the proposition to subscribe for $300,000 of the stock of the company which has been formed to complete a road from Vancouver to connect with the Northern Pacific at the International boundary line, near Sumas, Wash., resulted in the subscription being voted by a majority of 137.

Canadian Pacific.—It is expected that the grading of the new road into Crow's Nest Pass will be completed within three or four weeks. Gangs of graders are scattered along the road for over 80 miles and into the mouth of the pass. Grading will not be continued beyond that point, and no rails will be laid this year.

C. W. Spencer, Superintendent of the Eastern Division, has recently inspected the road now being built by that company west from Renfrew, Ont., giving direct rail communication between Ottawa and Parry Sound, over that road. He says the grading between Douglas and Eganville, Ont., is nearly finished, and he expects that the road between Renfrew and Eganville will be in operation by Oct. 20 and trains running from Ottawa. This company is building a trestle of about 400 ft. in length about four miles from Renfrew.

Canon City & Cripple Creek.—Chief Engineer Summer, who recently began the survey for this proposed road to the Cripple Creek mines, reports that the work has made considerable progress, and in a few days a second party of engineers will begin a survey from Canon City, Col., north. It is reported that some heavy grading has already been done at a few points along the route north of Cañon City in gulches and passes.

Chicago, Rock Island & Pacific.—The contractors are reported to have 2,000 men working on the new line from Lincoln southwest. Some delay has been occasioned in the grading by failure to secure right of way in time. O'Shea & Neville have been working near Lincoln for three weeks. The new branch leaves the present line at Twenty-seventh street crossing in Lincoln and extends to Jansen, a town about half way between Fairbury and Beatrice, Neb.

Colorado Midland.—About 200 men are being employed at present on the grade of the new branch to Cripple Creek, Col. Nine miles of the new line is under construction from Hayden Divide, Col., north to the new town of Midland. It is expected to complete the section about Nov. 10, the work having been commenced on Sept. 8. Bids for the terminals of the new branch, which is to be standard gauge, were let last week to Price & McGavock, of Hutchinson, Kan., who are building the nine miles to Midland. Highways will be built from that town to the various mines at Cripple Creek.

Coos Bay, Rosenburg & Eastern.—A ship with over 100 tons of rails for this road sailed from San Francisco Sept. 28, for Marshfield, Or., and as soon as the rails are delivered at that point the track laying will be resumed to Coquille City. The road is already built for 10 miles south of Marshfield and is graded for eight miles more, Coquille City being about 22 miles south of Marshfield. It is reported that John D. Spreckels & Co., of San Francisco have secured control of a majority of the stock of the road and propose to complete the line to Coquille City immediately and extend it next spring to Myrtle Point and perhaps also to Roseburg, Or., on the Southern Pacific, about 100 miles east of Marshfield.

Crystal River.—Work is now in progress on the line from the mouth of Coal Creek to Coal Basin, Col., and Orman & Crook, of Pueblo, Col., who have the contract for 12 miles of the new road, including the line from Carbondale to Crystal and to Coal Basin, have sublet the work. The names of the sub-contractors are as follows: Ryan Bros., Dunphry & Nelson, George Winchester and W. R. Day.

Duluth & Iron Range.—The branch to the Mesaba iron range will be completed about Oct. 20. Grading has been finished west to Embarrass River, a distance of 12 miles from the main line, and the track will be completed to that point this week. This work was delayed by high water early in the season and lately by the scarcity of men. One of the contractors said to the engineer in charge of the work: "I would give $100 for the privilege of discharging a man." While at no time the number of men on the work has exceeded 300, there have been employed, first and last, over 1,600.

Duluth, Mesaba & Northern.—Track has been laid to the Mountain iron mine, and, pending the completion of the bridge across the St. Louis River at New Duluth, Minn., the ore docks on Allouez Bay, Superior, Wis., will be reached by the track of the Northern Pacific.

Duluth, Red Wing & Southern.—A two-mile branch to the Clay Pits near Clay Bank station, Minn., has been completed. This, together with spurs to manufacturing industries, makes 3½ miles of road built this year.

Flava Land & Development Co.—The incorporation of this company in Oregon, to undertake railroad construction, was noted three weeks ago. The route of the new road is to be from Tansy Point on the Columbia River near Astoria southeast to Salem, Or., about 100 miles by way of the Nehalem River, Tillamook Bay or Sheridan, and also from Tansy Point to the Pacific Ocean in Clatsop County known as Clatsop Beach. The incorporators are S. H. Brown, L. B. Seeley, N. Goodwin Reid, E. L. Dwyer, of Portland, Or.

Florence, Cripple Creek & State Line.—President W. E. Johnson announces that the work will begin this week on the bridge across the Arkansas River at Florence, Col., and that the grading on the new line north of that town will be pushed vigorously. The statement made a number of times during the summer that contracts for grading would be let "in a few days," is again repeated, and it is stated that some ties have been already delivered at Florence. The city council has granted the company right of way through the town from the Denver and Rio Grande to the Arkansas River.

Great Northern.—Fair progress is being made on the rebuilding of the Casselton-Mayville branch in North Dakota. Steel has been laid on 23 miles and the work will stop at Blanchard for the winter.

Houston.—The charter of this road, recently issued, describes it as a suburban line to extend from the track of the Houston & Texas Central, one-half-mile west of the city, northwest to Houston Heights, about three miles from the city, with branches not to exceed nine miles in all. The capital stock is $90,000. The incorporators are O. M. Carter, of Omaha; D. D. Cowley, A. Scherffius, C. A. McKinney, H. F. McGregor, A. F. Morey, William Shannon, A. W. Leman, A. L. Donnaud and John F. Shannon. The road will be built by the Omaha & Texas Land Co., and work has already begun.

La Porte, Houston & Northern.—It is proposed to begin running trains into Houston, Tex., on Oct. 15, the company having built its own road as far as Harrisburg, Tex., 14 miles from Trinity Bay. The bridge over Vincent's bayou is being put up, and work will begin soon on the bridge over Simms' bayou, below Harrisburg.

Little Falls and Dolgeville.—The last of the heavy bridges on this line, over Ransom Creek, was so far finished by the contractors on Oct. 14 that the first locomotive went over it the same night. There only remains three miles of tracks to be laid from the ends of the bridge to Dolgeville, N. Y. The road will be open for business Nov. 1st between Little Falls and Dolgeville, 11 miles. Goddeffroy & Howe, 45 Broadway, New York, are the contractors.

Missouri, Kansas & Texas.—The construction department is very busy building the Lockhart and Houston extensions, and both grading and locating work is under way on the latter line. The officers have not given any definite information concerning the location east of Sealey, but the last report is that the approved survey crosses the Brazos River 2¼ miles south of Pattison, parallels the Texas Western for nearly 15 miles from the river, and thence runs nearly east to Eureka, on the Houston & Texas Central, 6 miles from Houston and thence to the city. The grading on the western section of this branch has been completed to New Ulm and will soon reach Sealey on the west side of the Brazos River. Large yards are being laid out at Houston, and they will be ready for track laying before Jan. 1.

The track laying on the Lockhart extension has been completed from Smithville on the main line west to Lockhart, 38 miles, and only the surfacing and ballasting remains to be done, so that the line will be open for traffic in a few days.

New Boston.—Ward Brothers, who have the contract for building this branch of the Concord & Montreal, have about 200 men on the work at present, and the grading has made considerable progress. Much rock is met with, which prevents very rapid progress being made. The grades of the new line, however, will be light, and the maximum curvature will be six degrees. Two bridges will be built with spans of 60 and 80 ft. The branch is over 4¼ miles long from Parkers Station, west of Manchester, south to New Boston, N. H. Ward Brothers, whose present headquarters are at Goffstown, N. H., have the contract for the grading and the tracklaying.

New Roads.—S. W. Keene, of Crested Butte, Col., who is the projector of the proposed road to Yule Creek, has arranged to begin the grading this week, but it is not likely that more than a few men will be employed for some time. The new road will reach marble quarries at Yule Creek, and it is proposed to do the grading this year, so that some marble may be carried from the quarries by wagon during the winter, and the rails will be laid early next spring connecting the quarries with the branch of the Denver & Rio Grande, which extends north from Gunnison to Crested Butte.

George Harding, of Catskill, N. Y., is reported to be the promoter of a new road leading up into the Catskills from the main line of the West Shore at West Saugerties, N. Y. The following account of the project is given: After reaching the base of Mt. Lincoln the line ascends gradually on the north slope of mountain with the Kaaterskill cañon on the right. It passes through Santa Cruz and Twilight parks and the upper terminus is reached near the Laurel House at Kaaterskill Falls. The ascent from the West Shore road is a little over 2,000 ft.

W. E. Alexander, of Denver, President of the Denver Land & Water Storage Co., proposes to build a new road about eight miles long southeast from University Park, Col., through land owned by the company. It is expected that the construction of the road will begin within two months, and it is estimated that it will cost about $75,000. The plan of using electric motive power has been given up, and steam locomotives will be used.

Work on the road which is being built between Chippewa and Quebec, along the Canadian side of the Niagara River, is reported to be progressing rapidly. The grading for the entire 15 miles is said to be nearly finished, and the rails are laid from Chippewa to near the whirlpool.

New York Central & Hudson River.—The advisability of building a belt line from Syracuse to Dewitt (or East Syracuse) which are about five miles distant from each other, is reported to be under consideration by the officers of the company.

New York & Chicago Short Line.—The newspapers report the filing of a charter in Illinois under this name. The incorporators are reported to be John J. McKelvey, of New York City; John McKelvey, Henry T. Huntington, Charles A. Judson and W. V. Latham, of Sandusky, O., who have been directors of several projected roads in Ohio, not yet built.

Ohio Southern.—The company is having surveys made from Springfield to Lima and to Toledo, O., and at a meeting of stockholders to be held Oct. 15 it will be determined which line to adopt.

Philadelphia & New England.—A press dispatch states that the locating survey for the division along the Delaware River has reached Matamoras, Pa., opposite Port Jervis, a distance of about 40 miles northeast of Stroudsburg from which the surveys were begun. The engineers report that the land owners will readily give right of way for the new road.

Philadelphia, Newtown & New York.—The branch of the road now under construction from Olney to a point between Tabor and Logan stations, Pa., on the Reading road, is making fair progress, but will not be finished in time for the opening of the Reading terminal, as it was thought it might be. Starting at the western end, the roadbed, which is an embankment for the entire length, is practically finished as far as the North Penn road, where an overhead bridge has been built. From this point to Fifth street a large amount of filling is required, and considerable work has been done. At Fifth street a stone arch bridge is being constructed. No work has been done east of Fifth street except at Olney station. All the roadway is being made for a double track line, as it is intended to lay a second track on the Newtown road from Olney to Bethayres, and run the New York route fast trains that way instead of by way of Jenkintown, which is about two miles longer and has heavy grades. Trains to Frankford over the Reading branch now building will use the new line and that portion of the Newtown road between Olney and Crescentville, where the Frankford branch begins.

Port Arthur, Duluth & Western.—This road is fast approaching completion to the international boundary. The line in operation is in first class condition, and is 91 miles in length and passes through a fertile country southwest of Port Arthur, Ont., especially in the valley of White Fish River, while forests of pine stretch south toward the Height of Land.

Portland & Rumford Falls.—It has been decided to lengthen the time in which bids may be presented for the construction of the extension of this road, and Chief Engineer Danforth has issued a notice making the limit date Oct. 24 instead of Oct. 8. The extension, as heretofore noted in these columns, is to run from Mechanic Falls, Me., southeastward to a connection with the Maine Central, near Danville Junction.

Providence & Springfield.—The contract for building the road from Pascoag, R. I., to Douglas Junction, Mass., a distance of eight miles, has been awarded to Ward Bros. of Kennebunk, Me.

Shelton Southwestern.—The organization of this company to take over the Mason County Central road in Washington, has already been noted. The road was built chiefly to reach timber lands owned by A. C. Mason, of Tacoma, and is now about 12 miles long, having been extended in the last eight months about four miles southwesterly from Shelton. It is said that there is 130,000,000 ft. of fir, spruce, cedar and hemlock timber tributary to the road, the last extension especially reaching very valuable timber. Excellent terminals are owned in Shelton adjacent to the Washington Southern road. The principal traffic of the road has heretofore been lumber, but it is now proposed to develop its general business.

State Line.—This road is owned by the Baltimore & Ohio and is an extension of the Fairmont, Morgantown & Pittsburgh, beginning at the dividing line between the states of Pennsylvania and West Virginia, which point is about two miles south of Point Marion, on the Monongahela River, at the mouth of the Cheat River; thence north, via Grassy Run, to Morgan's Summit; to George's Creek, at Smithfield, and up George's Creek, via Fairchance and Brownfield to Uniontown, Pa. The distance from State Line to Uniontown is 22 miles, but from Uniontown the line is in operation to Connellsville, 13 miles, connecting at

Connellsville with the Pittsburgh & Connellsville road. The Fairmont, Morgantown & Pittsburgh begins at Fairmont, W. Va., on the Fourth Division of the Baltimore & Ohio, and extends northward through Morgantown, W. Va., to the West Virginia and Pennsylvania State lines, 36 miles, making, when the work is completed, a continuous line from Fairmont, W. Va., to Pittsburgh, Pa., and affording a direct line for the Camden system of roads and the West Virginia Central to Pittsburgh. The line for almost its entire length passes through large and valuable coal fields, and important industries are in operation at many points. The grades are easy and alignment good. The track has been laid from Smithfield to Uniontown, 10¼ miles, this year, and north of Morgantown a few miles, and the road is being operated. All of the remainder of the line from Morgantown to Smithfield is under contract, and the track will be laid to Point Marion by Jan. 1, and the whole line will be completed and in operation by May, 1893. The distance from Fairmont to Connellsville is 71 miles. The contractors are Lane Bros. & Co., P. H. Bennett; Bennett & Talbott, Drake & Stratton and Langhorne & Allen.

Texas, Louisiana & Houston.—The road has resumed the construction of its line east of Conroe, Tex., and has begun laying 12 miles of rails on the grade already prepared. All bridges will be completed and track laid to the crossing of the Houston East & West Texas road, a distance of 15½ miles, by Oct. 15.

Trinidad & San Luis Valley.—The surveys west of Trinidad, Col., will probably be completed this week to the proposed terminus, Costillo Pass, at the southern boundary line of the state and about 60 miles southwest of Trinidad. The Board of Trade of Trinidad proposed to build the road, and it is understood that a conditional contract has been made with J. R. De Remer of Denver to build the line. Last week a party consisting of Morgan Jones of Fort Worth, J. R. De Remer and D. A. Chapell of Denver began an inspection tour of the proposed route to San Luis Valley.

Victoria & Sidney.—The work of clearing the right of way on the first section of this road in British Columbia has been commenced, Mr. Fraser, who has a contract for five miles of the road, beginning work with his force of men on the Sidney end of the road last week.

Yakima & Pacific Coast.—The work on the bridges on the western section is going on actively, and they will be completed very soon, so that tracklaying will not be delayed. Only 3½ miles of light grading remains to be completed and all the forces are now being centred on this work, as the cuts and fills which have occupied so much time are completed. All grading will be finished this month and tracklaying, which has commenced, will be uninterrupted until South Bend, Wash., on the Pacific coast is reached. Station buildings are being erected.

GENERAL RAILROAD NEWS.

Boston & Lowell.—The company has bought the land and buildings of the McLean Insane Asylum at Somerville, Mass., near Boston, for a sum said to be between $700,000 and $800,000. Besides the buildings, the property consists of over 100 acres of land, which is adjacent to the Boston & Lowell and Fitchburg and Grand Junction roads and can be used for terminal purposes. It also has a valuable water front on the Mystic River.

Charleston, Cincinnati & Chicago.—The Reorganization Committee announces that the plan of reorganization has received the approval of holders of over $6,000,000 of first mortgage bonds and coupons, which have been deposited under the plan of Aug. 2, 1892, which is more than the necessary majority of the total issue of bonds. Under this plan the capital stock of the company is fixed at $12,750,000, with $8,925,000 of first mortgage bonds and two series of second mortgage bonds of $4,462,500 each.

Chicago & Southside Rapid Transit.—A special meeting has been called for Dec. 1 to take action on the proposition to issue $3,000,000 first mortgage bonds on the "second section" of the elevated road to Jackson Park, Chicago.

Columbus, Hocking Valley & Toledo.—The action brought by Congressman James J. Belden, as a bondholder of this company, to compel the Central Trust Co. to see that the proceeds of $8,000,000 in bonds of the road, which it is claimed was misappropriated by ex-Judge Stevenson Burke and his associates, be applied to the purposes of the road, has been dismissed by Justice Ingraham of the New York Supreme Court. The company in 1881 issued $14,500 000 in bonds, payable in 1931 with interest at 5 per cent. It was provided that $6,500,000 should be used to refund other indebtedness, and that $8,000,000 should go to improve the road. The plaintiff charged that the proceeds of the $8,000,000 were not used in improvements on the road.

Fitchburg.—At the annual meeting in Boston on Sept. 28 it was voted to authorize the directors to issue bonds for $1,791,000, to retire $391,000 of the bonds of the Boston, Barre & Gardner road, and $1,400,000 of the bonds of the Boston, Hoosac Tunnel & Western, which roads have during the year been consolidated with the Fitchburg. It was voted to ratify the consolidation with the Boston, Hoosac Tunnel & Western and Monadnock roads to ratify the action of the directors in guaranteeing $100,000 of the bonds of the Brookline & Pepperell road, just opened for traffic.

Georgia.—The Central Railroad of Georgia has deposited with the Georgia Railroad Bank at Augusta $150,000 for its share of the half-yearly rental of the Georgia Railroad, the other half being paid by the Louisville & Nashville.

Louisville & Nashville.—The pamphlet report for the year ending June 30 shows:

	1892.	1891.	Inc.
Gross earnings	$21,235,721	$19,220,729	$2,014,992
Op. expenses	13,792,122	12,058,444	1,733,678
Net earnings	$7,443,599	$7,162,285	$281,314

Interest, rentals and taxes were $5,374,062, leaving a balance of $2,069,536. Income from investments was $533,293, making total income $2,602,829. The loss on the Georgia Railroad lease, $124,000, and losses on other roads, which are a claim against them, $128,001, leaves net income of $2,350,133. Deducting 2½ per cent. dividend, declared Jan. 7, $1,320,000, and 2 per cent. cash dividend, declared July 9, $1,056,000, leaves a deficit of $25,866. Expenditures for equipment were $2,440,970, an increase of $403,535. Passenger traffic increased 16.10 per cent.; freight traffic increased 12.24 per cent.; tonnage carried increased 14.28 per cent., and the average rate received per ton per mile was .7 of a cent, against .7266 of a cent last year.

Meriden, Waterbury & Connecticut River.—At the annual meeting on Nov. 8, the stockholders will be asked to ratify, confirm and approve the lease of the property and franchise of the company to the New York & New England, Sept. 1, 1892, for 99 years.

Minneapolis & St. Louis.—At the annual meeting in Minneapolis this week the stockholders adopted resolutions requesting the Board of Directors to take action toward restoring the property to its own management and taking it out of the receiver's hands.

New York Central & Hudson River.—The Court of Appeals at Albany has lately decided two suits which are thought to impair the title to a good deal of the land on which the main tracks of this road are built along the Hudson River. In Fishkill a certain owner granted the road a right of way immediately adjoining the water; subsequently the railroad company moved its tracks farther west, making the necessary filling to bring the surface above the water, under the impression that the title to the submerged land was vested in the railroad company; but the successor of the original grantors to the road now sues, claiming that all riparian rights belong to him. The court decides in this plaintiff's favor on the ground that a grant to a railroad company does not convey the rights that would be conveyed to a private individual in fee simple. It is said that a number of other suits hinge on this decision. On the same day the same court decided in favor of the City of New York in a suit brought to acquire title to certain wharf properties in New York City at Thirty-fifth and Forty-second streets. The railroad company opposed the city's claim on the ground that the property was to be taken for private uses, but the decision is against the railroad.

The following statement of earnings and operating expenses for the quarter ending Sept. 30 reports audited figures for 1891, but earnings partly estimated for 1892:

	1892.	1891.	Inc. or Dec.
Gross earnings	$12,039,181	$11,857,967	I. $151,191
Operating expenses	8 287.038	7,657.103	I. 630,035
P. c. expen. to earn	68.83	64.41	
Net earnings	$3,752.443	$4,230,984	D. $478,542
Fixed charges	2,508,308	2,466,929	I. 41,379
Profit	$1,244.135	$1,764,055	D. $519,920
Dividend	1,117.854	1,117,854	.....
Surplus	$126,281	$646,201	D. $519,920

New York, Lake Erie & Western.—The earnings of the system for the month of August and for the fiscal year to Aug. 31, eleven months, are given in the following table:

Month of August.	1892.	1891.	Inc. or dec.
Gross earnings	$2,677,561	$2,946,268	D. $268 767
Oper. expenses	1,836,420	1,823,923	I. 12,497
	$841,081	$1,122,345	D. $281,264
Due to leased lines	242,426	266,551	D. 24,125
Net earnings	$598,655	$855,791	D. $257,139
Eleven months, Oct. 1 to Aug. 31.			
Gross earnings	$28,455.095	$27,155.382	I. $1,299,713
Oper. expenses	19,284,722	17,736.312	I. 1,546,410
	$9.172,373	$9,419 070	D. $246,697
Due to leased lines	2 359,824	2,368,789	I. 11,035
Net earnings	$6,772,550	$7,030,281	D. $257,731

Plymouth & Middleboro.—The first passenger train to make the trip from Plymouth to Middleboro, Mass., went over the road last week, the distance being 15 miles. The new line will be opened for regular passenger traffic by Oct. 15, when it will be operated by the Old Colony, connection being made at both Plymouth and Middleboro.

Terre Haute & Peoria.—The Terre Haute & Indianapolis has leased this road, which is operated between Terre Haute and Peoria, Ill., 144 miles, and it began the operation of the line on Oct. 3. The lease is for 99 years and is for 30 per cent. of the gross earnings.

Toledo and Ohio Central.—At the stockholders' meeting at Toledo, O., Sept. 30, the following propositions were adopted: To purchase that part of the Toledo, Columbus & Cincinnati railway between Toledo and Ridgeway, Hardin County; to build an extension from Ridgeway to Columbus; to issue $2,500.000 bonds to cover this extension and other improvements, and to increase the capital stock from $4,849,000 to $6,500,000.

Washington & Columbia.—The organization of this company was completed at Walla Walla, Wash., last week, when officers were elected. The road was chartered last August and has been organized to operate the Oregon & Washington Territory road. There is to be no change of management, the new company having been organized by Charles P. Wright, of Philadelphia, who bought the controlling interest in the property early in 1891. The new company will not be able to assume the operation of the road for several weeks as several suits are still pending in the United States courts. The road was built in 1889 by George W. Hunt, a railroad contractor of Tacoma, and the main line extends from Pendleton to Dayton, Wash., 127 miles, with branches aggregating about 35 miles.

TRAFFIC.

Traffic Notes.

Reports of severe shortage of freight cars come from Denver and from Houston, Tex., as well as from many places in the Central Western States.

The New York, Lake Erie & Western has restored the regular ticket rate from New York to Buffalo, the Lackawanna having withdrawn its tickets from the brokers' offices.

The quarantine restrictions established by the Texas State authorities against New York have been withdrawn. All freight and passengers will now be permitted to go through without detention.

The railroads centring in New Orleans have lately tried to agree upon a rule to charge storage for freight in freight houses after 48 hours, but in consequence of the protests of consignees the plan has not yet been put in effect.

The Massachusetts law requiring railroads to accept each other's mileage tickets, sold at two cents a mile, was to go into effect on Oct. 1, but all the roads except the New York & New England have refused to take action and refused to accept tickets of other companies. The matter will probably be tested in the courts.

Judge Wallace, of the United States Circuit Court at New York, has decided against the railroad company in the suit brought by the Interstate Commerce Commission against the Texas & Pacific. This suit was brought to compel compliance with the Commission's order respecting rates to California on freight from Europe.

The Interstate Commerce Commission has received a complaint from San Francisco, alleging that the California delegates to the Republican and Democratic national conventions last June were carried over the Southern Pacific and Union Pacific at half fare, while the delegates to the Omaha convention of the People's party were compelled to pay full rates, although there were as many of them as to either of the other conventions.

The Western reporters last week gave the world the information that anthracite coal would probably be brought from Colorado to Chicago to compete with that from Pennsylvania, in consequence of the advance in price of the latter; but the next day they came out with an important qualification of the story, to wit, that the distance from the Colorado mines to Chicago is about 1,350 miles, almost 50 per cent. greater than the distance from the Pennsylvania mines. Moreover, vessels have hitherto taken practically all the Pennsylvania coal for all but 400 miles of its journey, at rates with which the railroads have not yet been able to compete. It will therefore be a good while yet before the output of the Colorado mines is increased by the demand from Chicago.

Chicago Traffic Matters.

CHICAGO, Oct. 5, 1892.

The action of the other Chicago-Buffalo lines in making a round trip rate of $5 for the real estate men's convention at Buffalo in retaliation for the cut to $7.50 by the Nickel Plate resulted in "freezing out" that line, and it gave notice that it would not meet the $5 rate. The Michigan Central will get the bulk of the travel on account of the opportunity given excursionists to visit Niagara Falls.

The Commissioners of the Western Traffic Association have called a meeting for Oct. 7 to consider matters pending before them. There are no new developments in the association situation. As was to be expected, the Missouri Pacific, Wabash and Iowa Central have filed notices of withdrawal, and other roads will probably take similar action. Pending the meeting of the presidents, Oct. 11, all reports of definite action are pure speculations.

The Union Pacific, the Burlington & Missouri River and the Chicago, Rock Island & Pacific have filed notices of withdrawal from the Transcontinental Association, to take effect Jan. 1. This leaves only the Denver & Rio Grande and the Southern Pacific in the Association.

The Monon has made a further reduction in the Nashville rate, and is now quoting $8.50 for the round trip from Chicago to Cincinnati and return. The Illinois Central has been drawn into the fight, and has announced rates to New Orleans of $20 first-class, and $12.50 second-class; to Memphis, $12.85 first-class, and $7.50 second-class. The Illinois Central's first-class rate to New Orleans is still higher than that by the Monon and its Southern connections, but on second-class it fully meets the Monon's $4 reduction, the standard tariff being $16 50.

The Western Freight Association is studying over some plan by which the Chicago & Eastern Illinois can be induced to stop making a lower rate on soft coal via Joliet than via Chicago. This line has had in effect for several months a tariff in connection with its Chicago & Indiana coal road making a rate of 20 cents a ton less to western points via Joliet than via Chicago, the purpose being to divert all this freight via Joliet. Recently the Illinois Central complained to Chairman Midgley of this discrimination and asked authority to change the rate via Chicago. A meeting was called, but there was such a difference of opinion that, after discussing the situation, the lines asked the chairman to make a ruling upon the questions: 1. Whether the establishment of the rates via Joliet to points in the west and northwest had been duly authorized, and 2, whether, if the rates are properly established, or cannot be abolished, the lines via Chicago are entitled to an equalization. Chairman Midgley rules that, while there is no specific authorization, in the association records, of these tariffs via Joliet, there is no doubt that they are in effect and that their propriety is not seriously questioned; that they cannot at this time be withdrawn, and no sufficient reason has been assigned why they should be. In regard to equalization via Chicago, he rules that as the trouble is entirely with the line east of Joliet and the rate used from Joliet west is the established association rate, it is not possible to equalize via Joliet and that if an attempt is made to equalize via Chicago it is probable that the reduction would involve the other Chicago rate points, of which Joliet is one, and therefore no relief would be afforded. The adjustment of the difficulty involves the readjustment of rates on coal from all mining points in Illinois, and this should not be attempted until the matter has been carefully considered in conference.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Oct. 1 amounted to 62,284 tons, against 63,001 tons during the preceding week, a decrease of 717 tons, and against 57,928 tons during the corresponding week of 1891, an increase of 4,356 tons. The proportions carried by each road were:

Roads.	W'k to Oct. 1.		W'k to Sep. 24.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	10,042	16.1	9,962	15.8
Wabash	3,136	5.	3,513	5.6
Lake Shore & Michigan South.	9,717	15 6	9.318	14.8
Pitts., Ft. Wayne & Chicago	6.141	9.9	6,666	10.6
Pitts., Cin., Chicago & St. Louis	7,600	12.2	8 607	13.7
Baltimore & Ohio	4,092	6.6	3,263	5.2
Chicago & Grand Trunk	4,616	7.4	4,394	7.
New York, Chic. & St. Louis	6,803	10.9	6,943	11.
Chicago & Erie	7,666	12.3	8,997	14.1
C., C., C. & St. Louis	2,471	4.	1,699	2.2
Total	62,284	100.0	63,001	100.0

Of the above shipments, 3,134 tons were flour, 25,110 tons grain and millstuff, 10,890 tons cured meats, 11,041 tons dressed beef, 1,459 tons butter, and 6,738 tons lumber. The three Vanderbilt lines carried 42.6 per cent., the two Pennsylvania lines 22.1 per cent. The lake lines carried 126,476 tons, against 118,310 tons during the preceding week, an increase of 8,166 tons.

E. O. WESTINGHOUSE, JR., President. T. W. WELSH, Supt. JOHN CALDWELL, Treasurer. W. W. CARD, Secretary. H. H. WESTINGHOUSE General Manager.

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MANUFACTURERS OF THE

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The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.	Grand total.
1881	105	105
1882	1,085	1,190
1883	4,966	6,156
1884	15,051	21,207
1885	10,410	31,617
1886	8,946	40,563
1887	9,281	49,844
1888	27,696	77,540
1889	26,065	103,605
1890	50,502	154,107
1891	39,061	193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

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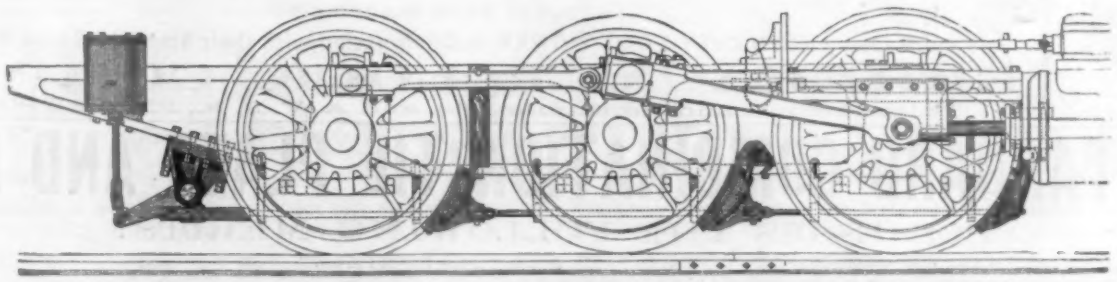

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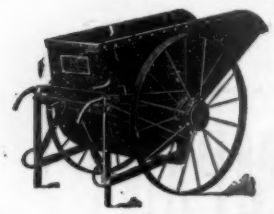

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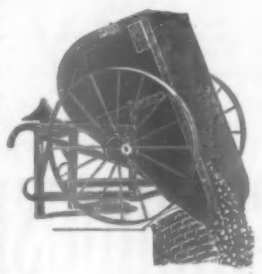

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MONTGOMERY, Ala., Feb. 8, 1892.

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J. E. WORSWICK, Master Mechanic.

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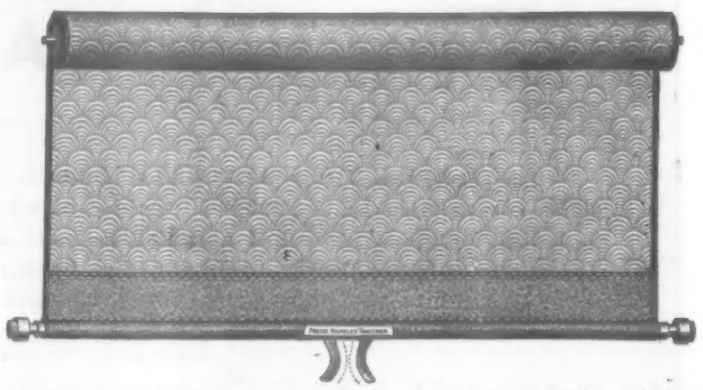

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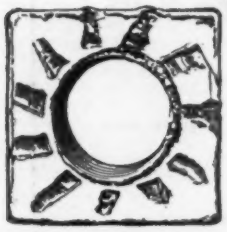

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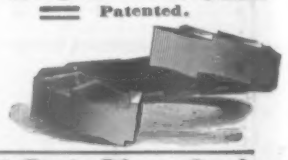

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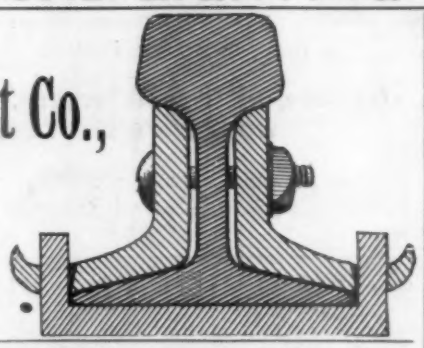

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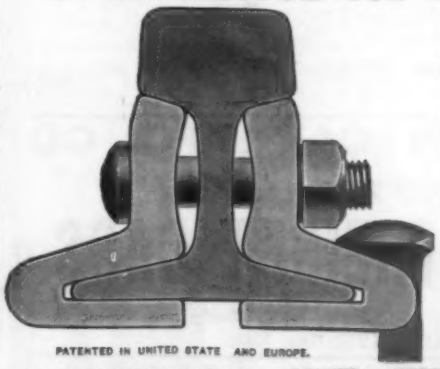

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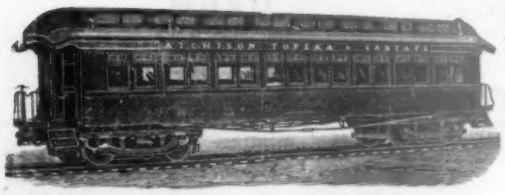
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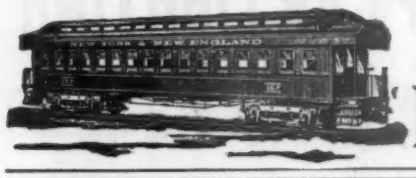

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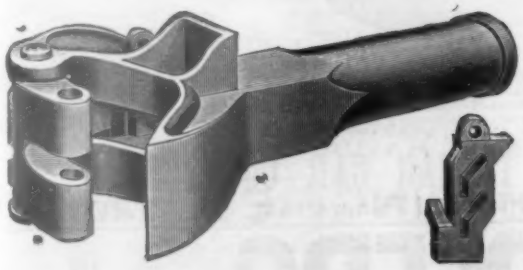

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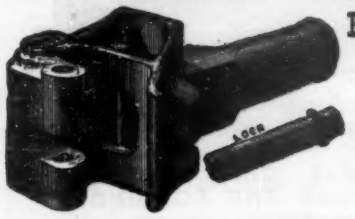

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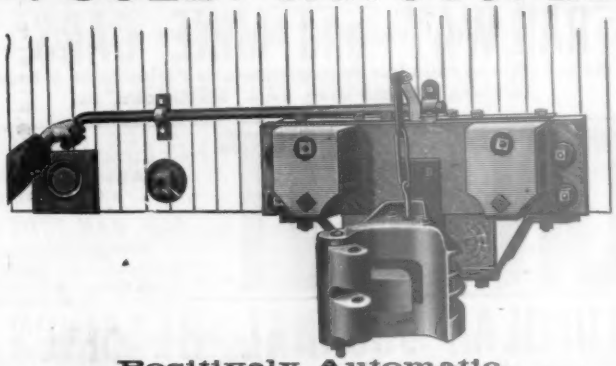

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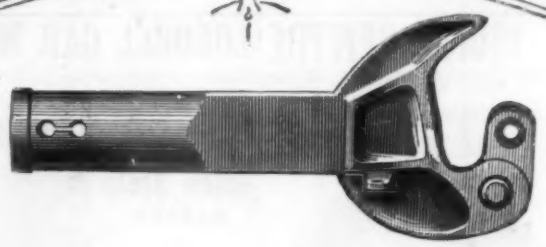

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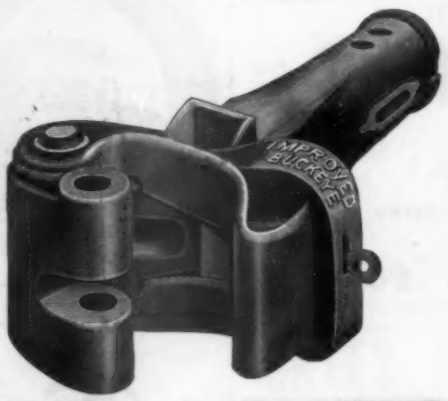
Master Car Builders' Standard in every particular. Combines the greatest obtainable strength and simplicity. Only Three Parts. Positive acting gravity lock and positive mechanical opening of knuckle. Absolute Central draft. Same movement that raises the lock throws open the knuckle.

Adopted as Standard by Several Leading Railroads After Severe Tests and Long Trials.



Sold with a GUARANTEE to Stand the Proposed M. C. B. Drop and Pulling Tests.

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THE BUCKEYE AUTOMATIC CAR COUPLER CO., Columbus, Ohio.

JOHNSTON CAR COUPLING COMPANY

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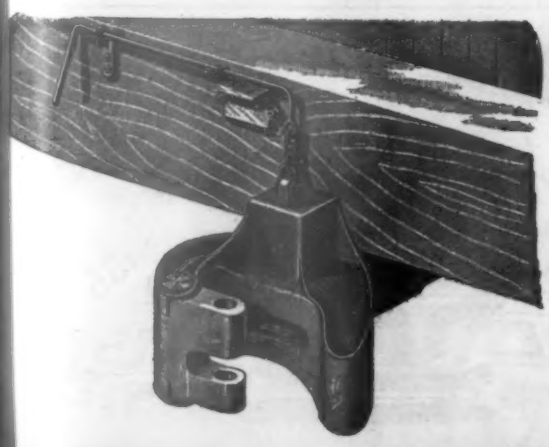

The Lightest, Simplest and Least Expensive Coupler in the Market.

WEIGHT 180 POUNDS.

MEETS ALL THE REQUIREMENTS OF THE M. C. B. LINES AND TESTS.

LOCKING DEVICE SIMPLE, DURABLE AND EFFECTIVE

It Has but Four Parts and Cannot Be Opened by Accident.

KNUCKLE OPENS AUTOMATICALLY.

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MANUFACTURERS OF

CHILLED WHEELS OF ALL PATTERNS AND SIZES FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.

CAPACITY, 400 WHEELS PER DAY.

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Spoke and Disc Steel Tired Wheels,

OF AMERICAN STANDARD.

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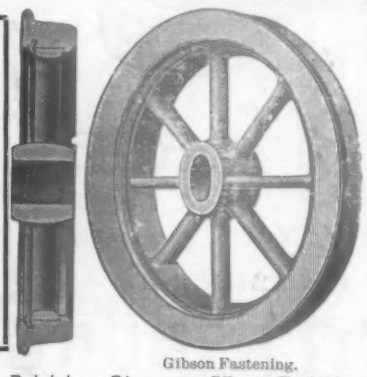

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Mansel Retaining Rings or Gibson Fastening.

Adopted as Standard Wheel on some of the Principal Roads in this country. Apply for Catalogue.

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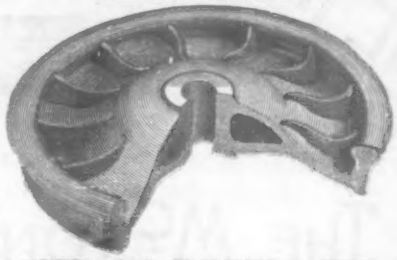
Double Plate, Single Plate AN Hollow Spoke WHEELS FOR Broad and Narrow-Gauge Cars Engines and Tenders.



Also OPEN AND Solid Plate STREET CAR WHEELS

Either in the Rough or Fitted on Axles.

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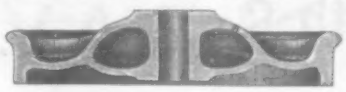

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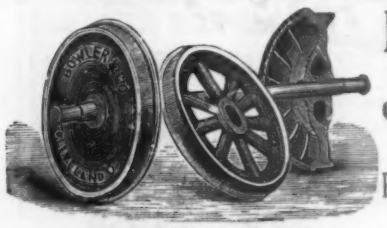

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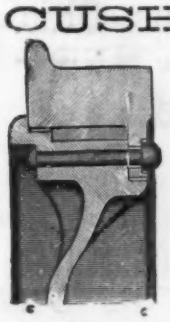

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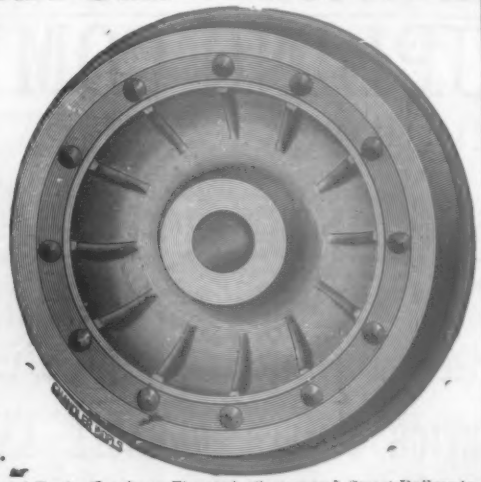

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ALL WHEELS GUARANTEED TO STAND SHOP TEST

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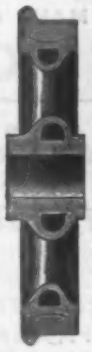

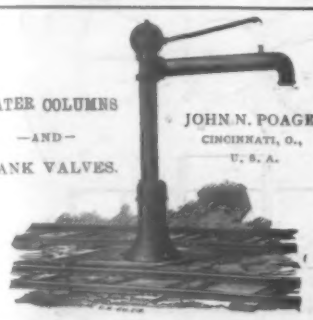

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The completion of inventions to practical application, including specifications and estimates, forwarded by new methods.

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No. 1.—**DOUBLE STEEL PLATE,** Corrugated, Flexible. Approved by 10 years' general service.

No. 2.—**WROUGHT IRON CENTRE,** with Steel Tire fastened by the Boies **Integral Tire Lock.** Only two parts—the practically indestructible Centre; the Steel Tire which can be replaced in any Railway Shop when worn out. **The Centre a Permanent Investment.**

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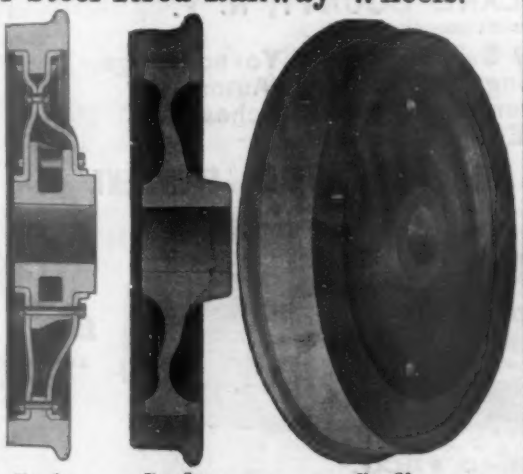

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American Steel Wheel Co.,

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J. H. OLHAUSEN, Vice-Prest.
G. W. CUSHING, Superintendent.
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Solid Steel Double Plate or Spoke Locomotive Truck, Tender, Passenger and Fast Freight Wheels, turned on tread and flange and balanced, on which we give a Mileage Guarantee.

Solid Steel Castings for Railroad Equipment generally, Miller Hooks, Buffers, Levers, Crossheads, Rockers etc., and Knuckles for repairing M. C. B. Drawheads.

This metal is acknowledged by R. R. officials to be especially adapted for Knuckles, owing to its superior strength and ductility.

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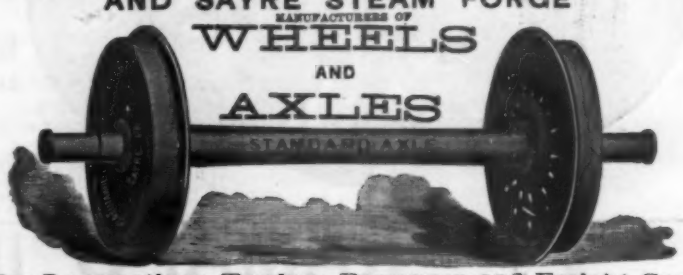

For Locomotives, Tenders, Passenger and Freight Cars.
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HINCKLEY AUTOMATIC BRAKE-SLACK ADJUSTER

Simple. Compact. Effective.

Piston of Air Brake Cylinder is automatically kept at any desired uniform stroke, resulting in full, effective piston pressure at all times.

APPLIED TO ANY TENSION ROD OF THE BRAKE SYSTEM.

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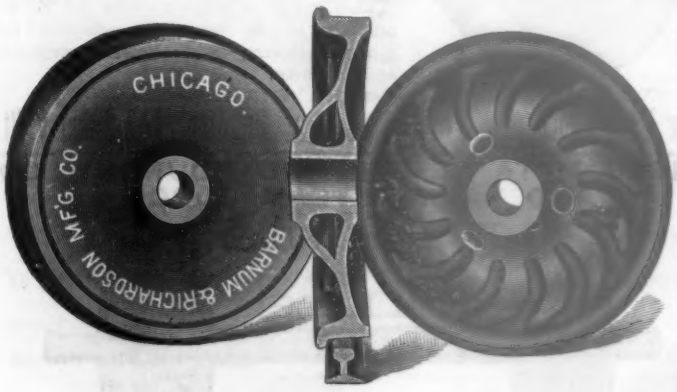

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STREET CAR WHEELS,

IN THE

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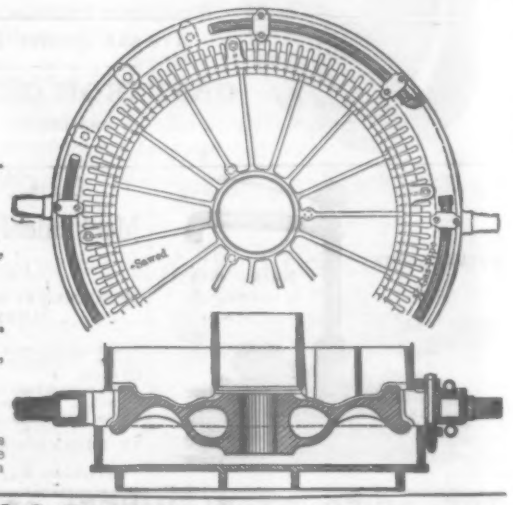
Machinery and Heavy Castings of all descriptions. Wheels are made perfectly cylindrical, uniform in chill, and with treads ground.



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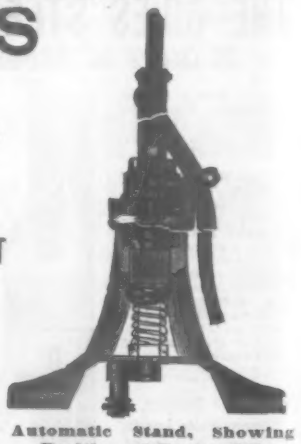
MANUFACTURERS OF

Switches, Automatic Safety Switch Stands, Yoked Frogs
Bolted Plate and Spring Rail Frogs, Automatic
Distant Signals Interlocked with Switches,
Crossings of Every Description.

GHT AND HEAVY CASTINGS AND GENERAL TRACK EQUIPMENT

Automatic Stand, Showing Position of Parts while being Thrown by Hand.

RAMAPO "YORK" FROG.



Automatic Stand, Showing Position of Parts while being Thrown Automatically by Train.

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CHILLED IRON CAR WHEELS

FROM SPECIAL QUALITY CHARCOAL IRON

FOR

Drawing Room and Sleeping Coaches, Locomotives, Tenders and Passenger and Freight Cars.

Congd on Brake Shoe. Raoul Journal Box

FOR DRIVERS & CAR WHEELS STEEL TIRED OR CHILLED
BRAKE SHOES
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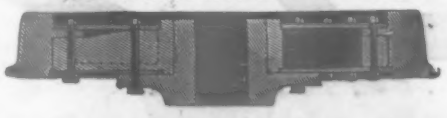
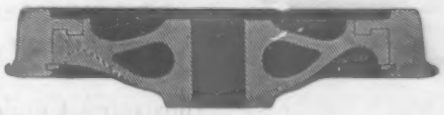
WITH TIRES HAVING ANNULAR WEBS.

BOLTED—WITH WROUGHT-IRON PLATES, CAST-IRON CENTRE AND INTERCHANGEABLE HUB.



BOLTLESS—WITH CAST-IRON DOUBLE PLATE OR SPOKE CENTR AND WEDGE-SHAPED RETAINING RING.



Both of these Wheels can be Re-tired in any Ordinary Machine Shop

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DON'T MAKE MISTAKES,

but patronize the Electric Lighted, Steam Heated Vestibuled Trains of the

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Through cars between Chicago and Portland Oregon, via St. Paul & Nor. Pac. R. R., and through cars between Chicago and Denver, Colo., via Omaha and the B. & M. R. R. For further particulars apply to nearest Ticket Agent or address GEO. H. HEAFFORD, Gen'l Pass'r Ag't, CHICAGO, ILL.

between **CHICAGO** and **New York, Boston and the East.**

NEW YORK & NEW ENGLAND R. R.

New York and Boston Trains

Leave either city.....12:00 m *3:00 p. m.
Arrive at termini..... 6:30 p. m. *8:40 p. m.

TICKET OFFICES:
Grand Central Station, New York; 322 Washington Street, Boston.

*3:00 p. m.—The "White Train."—Runs daily, including Sundays.

NOTE.—On Sunday the White Train arrives Boston and New York at 9:00 p. m.

Parlor and Dining Cars.

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Limited Trains

—LEAVE—

BOSTON and NEW YORK

—AT—

12:00 NOON, DUE 5:40 P. M.

—ONLY—

5 Hours and 40 Minutes.

The equipment of above trains will consist of baggage car, drawing room smoking car and two drawing room cars.

FARE $6.00,

Including seat in drawing room car.

Tickets will not be sold beyond the seating capacity of the train.

A. S. HANSON,
General Pass. Agent.

SUNDAY SERVICE.

On Sunday, May 22d, the Wisconsin Central Lines will resume its popular train service between Chicago, Waukesha and the Lake Region. Trains will leave the Grand Centaal Passenger Station, for Lake Villa (Fox Lake), Antioch, Mukwonago and Waukesha at 8:30 A. M., Sunday, arriving at Lake Villa 10:33 A. M., Antioch 10:40 A. M., Mukwonago 11:40 A. M., and Waukesha 11:49 A. M. Returning leave Waukesha 4:45 P. M., Mukwonago 5:05 P. M., Antioch 6:18 P. M., Lake Villa 6:30 P. M., arriving at Chicago 8:45 P. M. For the accommodation of excursionists desiring to remain in the country over Sunday "The Business Man's Special" will again be placed in service. This train will leave Waukesha at 5:30 A. M., arriving at Chicago at 8:50 A. M. For tickets, time tables and pamphlets apply to GEO. K. THOMPSON, City Passenger & Ticket Agent, Chicago, Ill. Or to JAS. C. POND, General Passenger & Ticket Agent, Chicago, Ill.

THE GREATEST THROUGH CAR LINE

BETWEEN THE EAST AND WEST.

LAKE SHORE ROUTE

Wagner Sleeping, Drawing Room and Private Compartment Cars between New York, Boston, Albany, Buffalo, Cleveland, Toledo, Chicago, Cincinnati and intermediate cities.

Route of the New York and Chicago Limited, Boston and Chicago Special and U. S. Fast Mails.

ONLY DOUBLE-TRACK LINE TO WORLD'S FAIR.

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GREAT TRUNK LINE AND UNITED STATES MAIL ROUTE. THE BEST CONSTRUCTED AND MOST COMPLETELY EQUIPPED RAILWAY IN AMERICA.

Connecting **all the principal cities on the Atlantic coast** with those in the **Mississippi Valley** and on the **Great Lakes. Through trains with Pullman Vestibule Cars attached, between New York, Philadelphia, Washington** and **Baltimore** and **Chicago, St. Louis, Cincinnati** and **Louisville.**

Baggage Checked to Destination. Fare always as low as by any other route.

For tickets, palace and parlor car accommodations, and all desired information, apply at the offices of the company: No. 205 Washington street, **Boston;** No. 1 Astor House, Nos. 435, 849 and 944 Broadway, and Desbrosses and Cortlandt street Ferries, **New York;** Nos. 838 and 1348 Chestnut street, and Broad Street Station, **Philadelphia;** N. E. corner Baltimore and Calvert streets, Union Station and Northern Central Railway Station, **Baltimore;** N. E. corner Thirteenth street and Pennsylvania avenue, and Baltimore and Potomac Railroad Station, **Washington City.**

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SOLID TRAINS

—BETWEEN—

NEW YORK AND CHICAGO,

Via Chautauqua Lake or Niagara Falls.

An Enchanting Panorama of Mountains Forests and Streams.

PULLMAN CARS

Between New York and Rochester, Buffalo Niagara Falls, Toronto, Chautauqua Lake, Cleveland, Cincinnati and Chicago.

D. I. ROBERTS, Gen'l Pass. Agt.

Short and Direct Through Car Line

BETWEEN

CINCINNATI, INDIANAPOLIS AND CHICAGO.

Private Compartment Buffet Sleeping Cars, Standard Wagner Palace Sleeping Cars and Elegant Reclining Chair Cars on Night Trains; Luxurious Parlor and Cafe Dining Cars on Day Trains.

THE SOUTHWESTERN LIMITED,

FROM ST. LOUIS, INDIANAPOLIS AND CINCINNATI TO NEW YORK AND BOSTON,

is the finest train in America, and provides the best and quickest service ever offered between the East and the West, landing passengers in the heart of New York City without ferry trans fer.

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CHICAGO & ALTON RAILROAD.

Ladies Palace Day Cars and Palace Reclining Chair Cars Free of Extra Charge, Pullman Palace Buffet Compartment Sleeping Cars, and Palace Dining Cars.

PULLMAN VESTIBULED TRAINS

Free of Extra Charge, and no Change of Cars of any Class Between

CHICAGO AND KANSAS CITY, CHICAGO AND ST. LOUIS, and ST. LOUIS AND KANSAS CITY.

Pioneer Pullman Palace Sleeping Car, Palace Dining Car, and Free Palace Reclining Chair Car Line.

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All through trains arrive at and depart from Grand Central Station, Fourth Ave. and 42d Street, New York, the very centre of the city.

THE DIRECT LINE BETWEEN NEW YORK AND NIAGARA FALLS

Wagner Palace Sleeping and Drawing-Room Cars on all through trains

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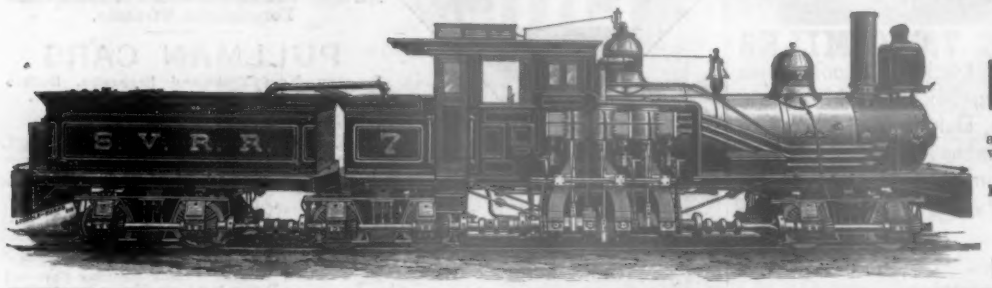

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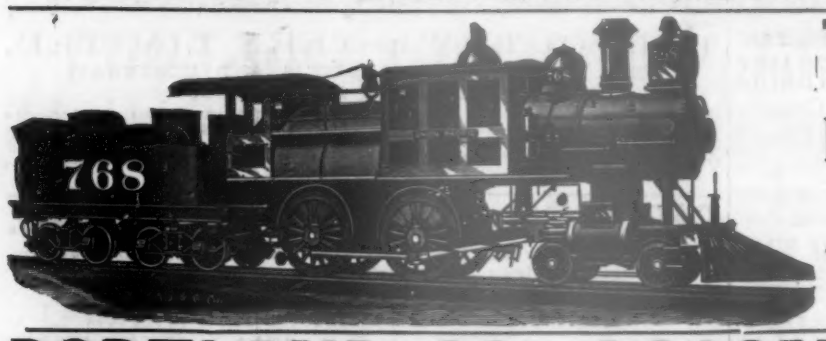

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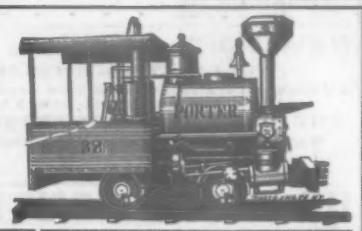

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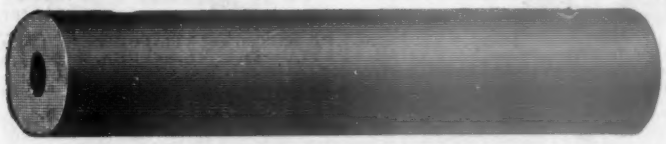

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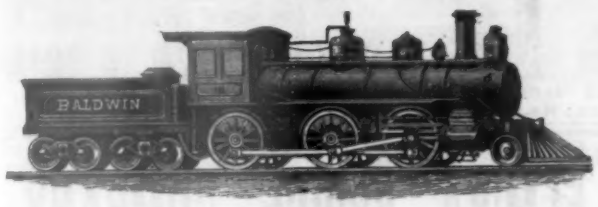

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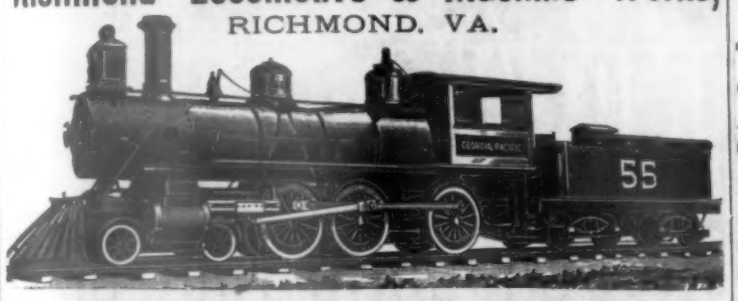

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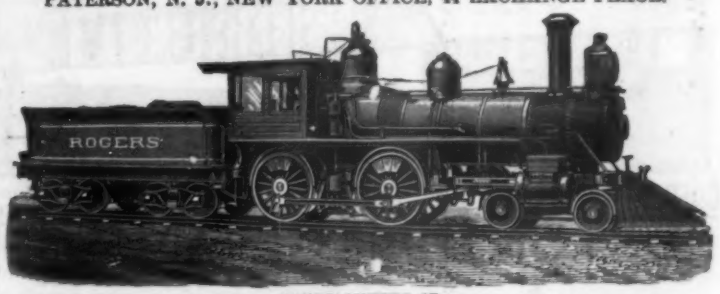

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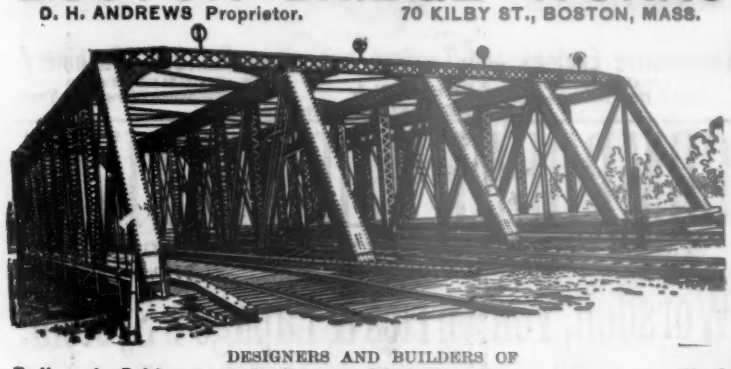

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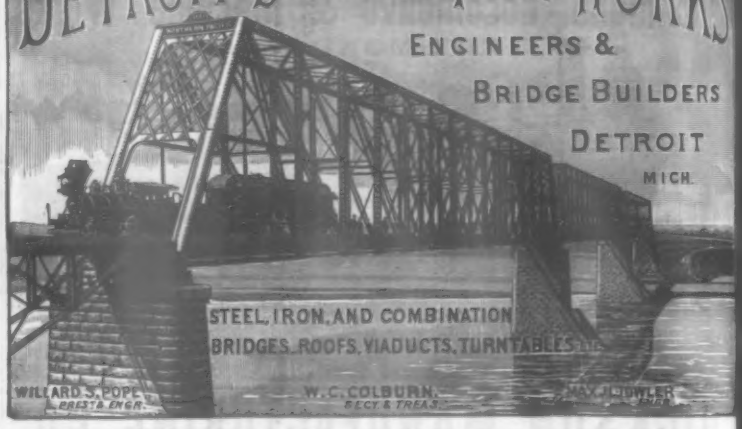

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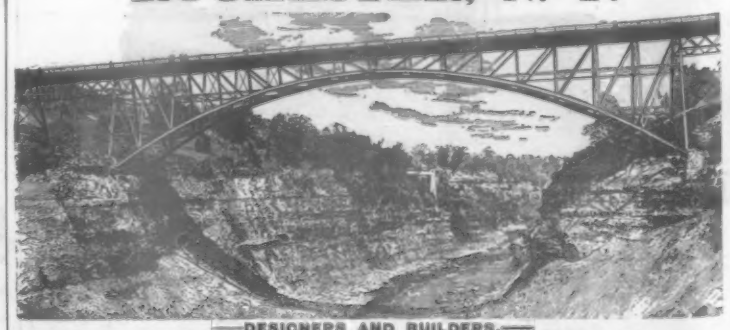

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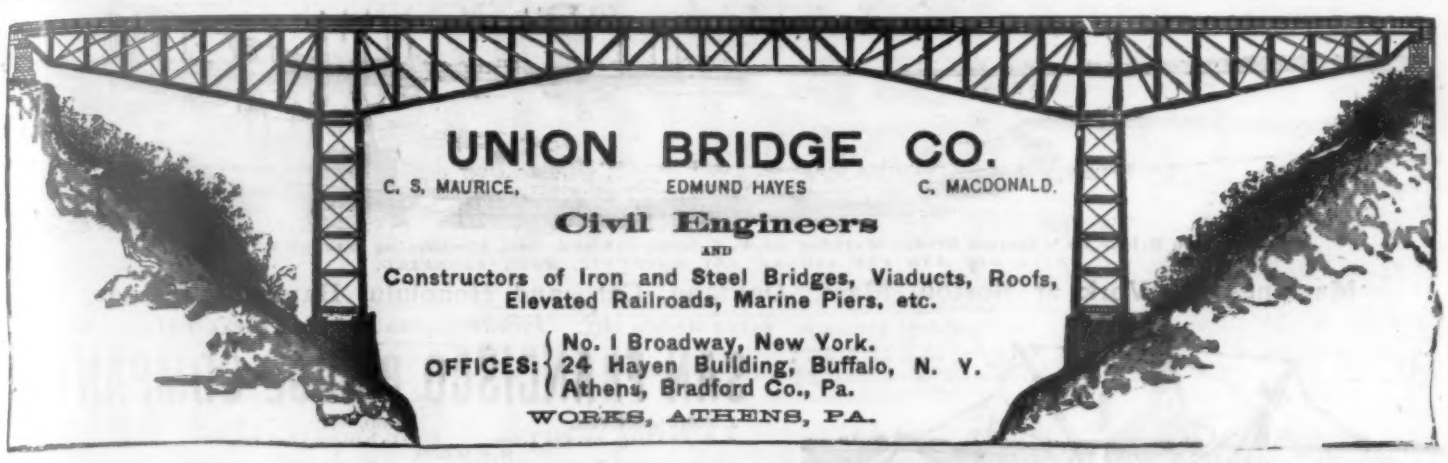

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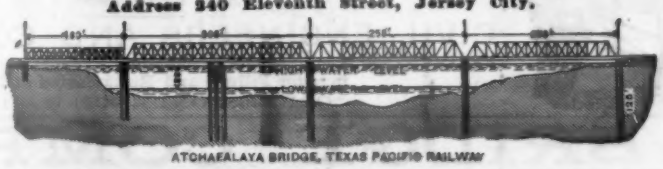

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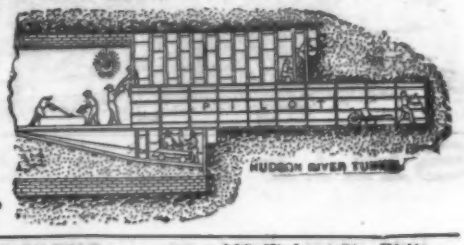

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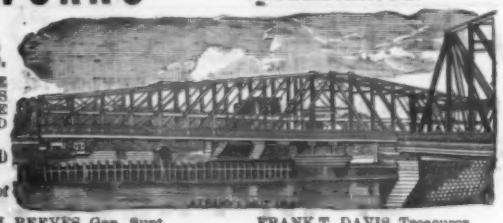

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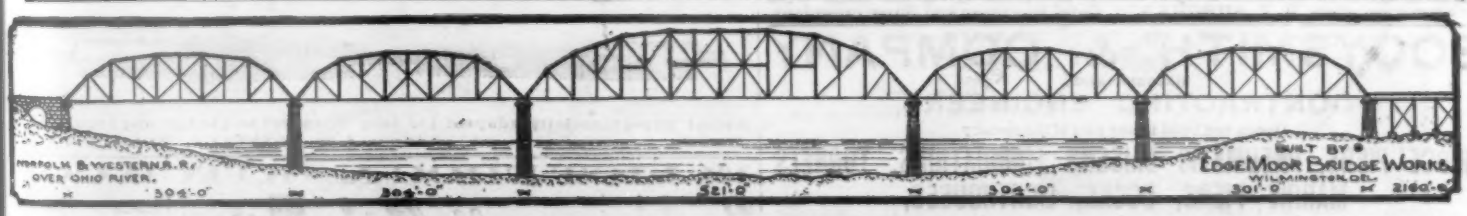

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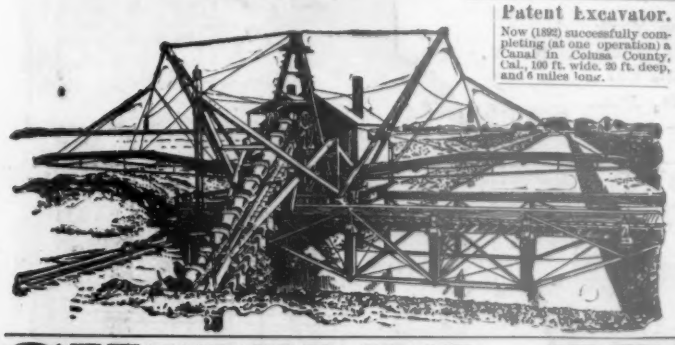

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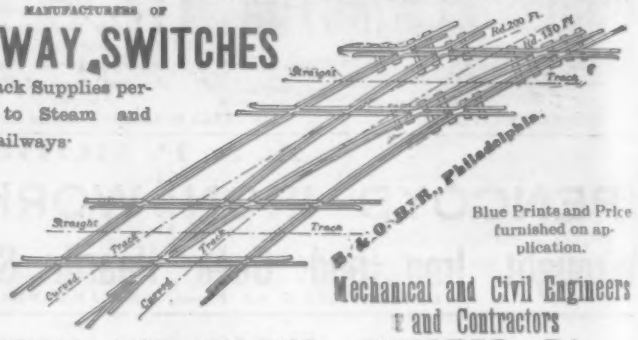

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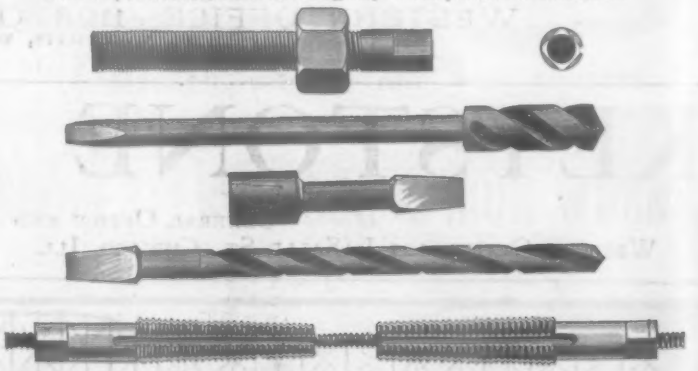

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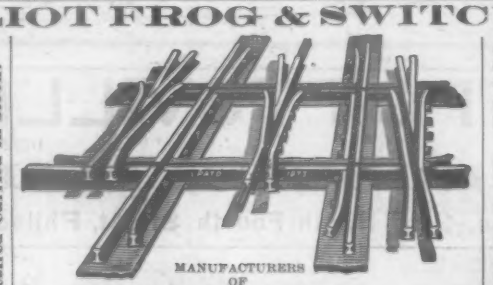

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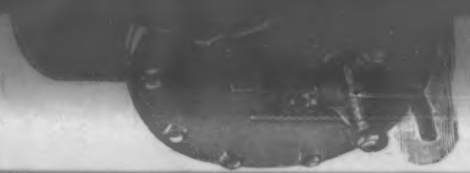

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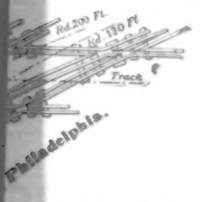

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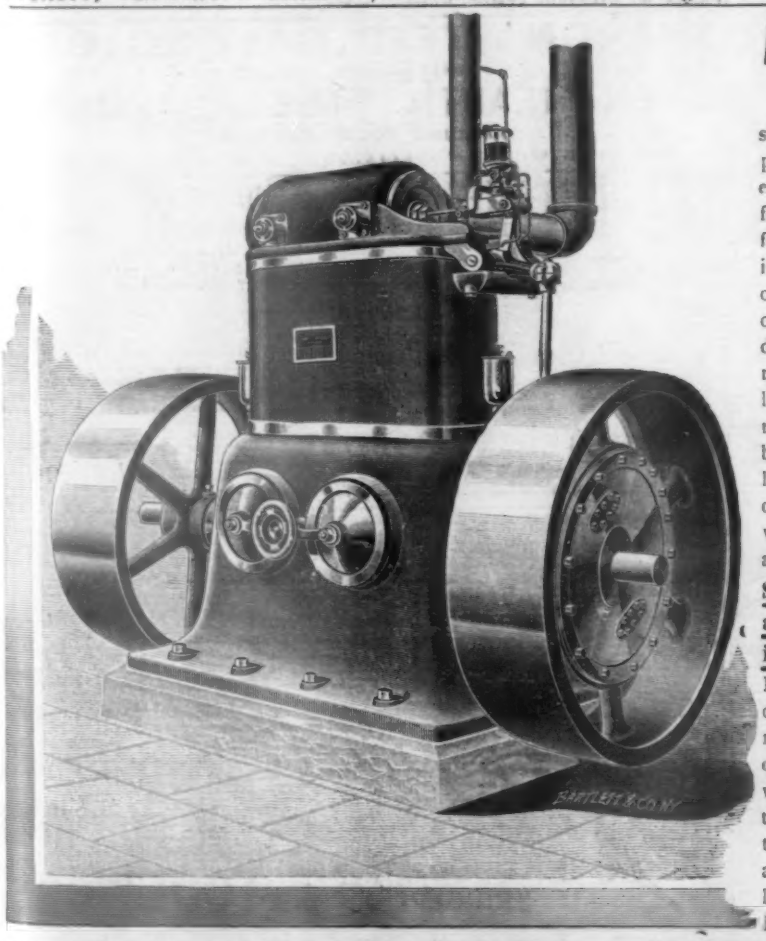

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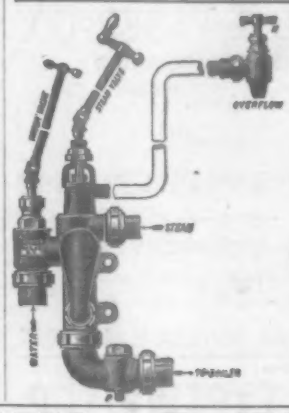

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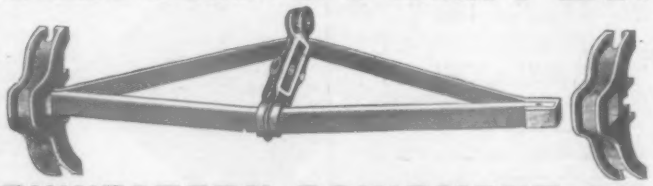
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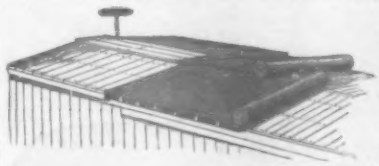
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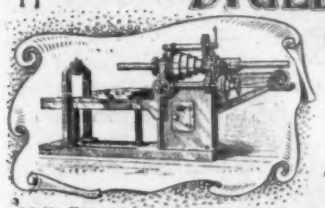
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